NOVEMBER 2, 1959

American Machinist

THE MAGAZINE OF METALWORKING MANUFACTURING

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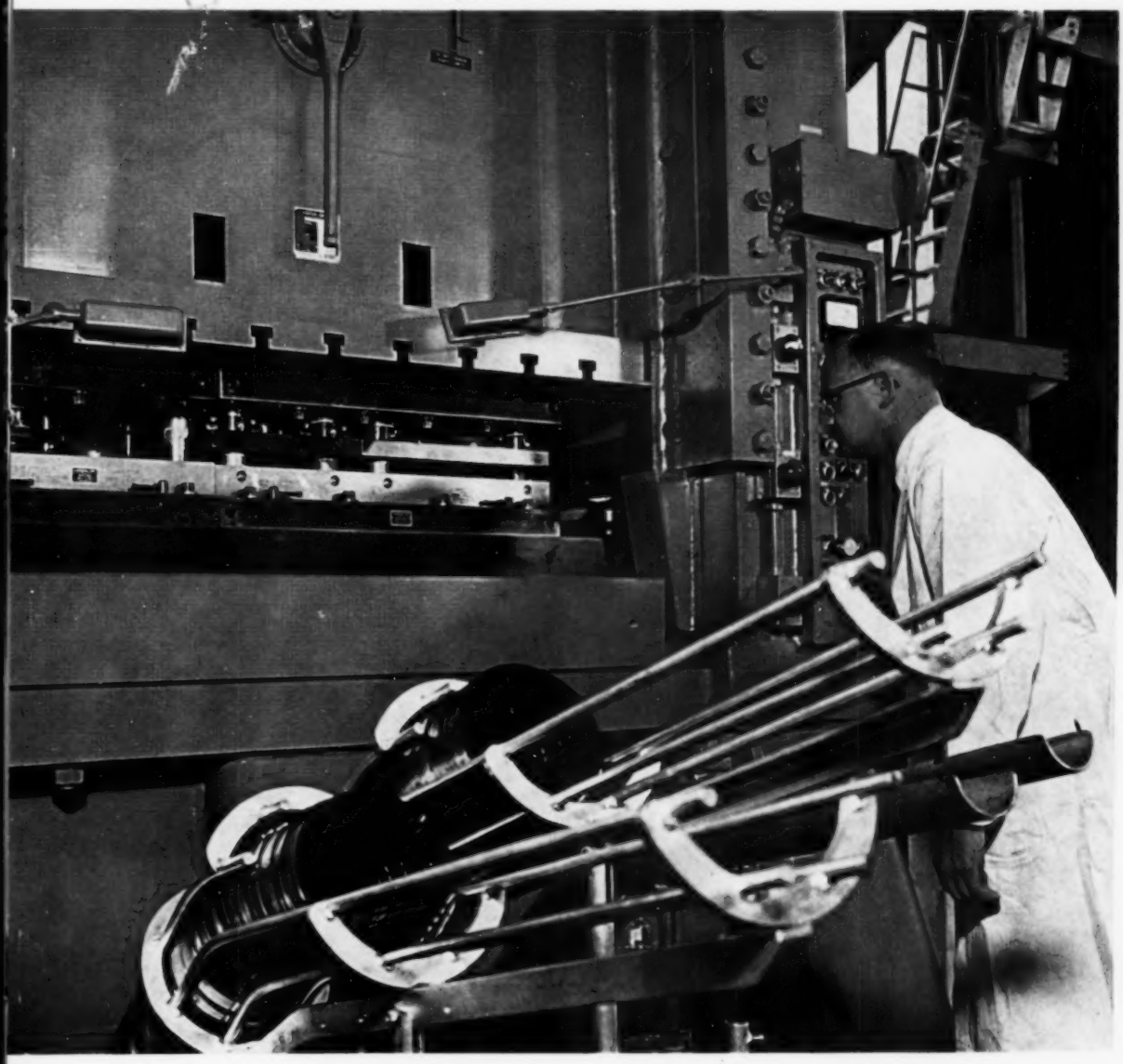
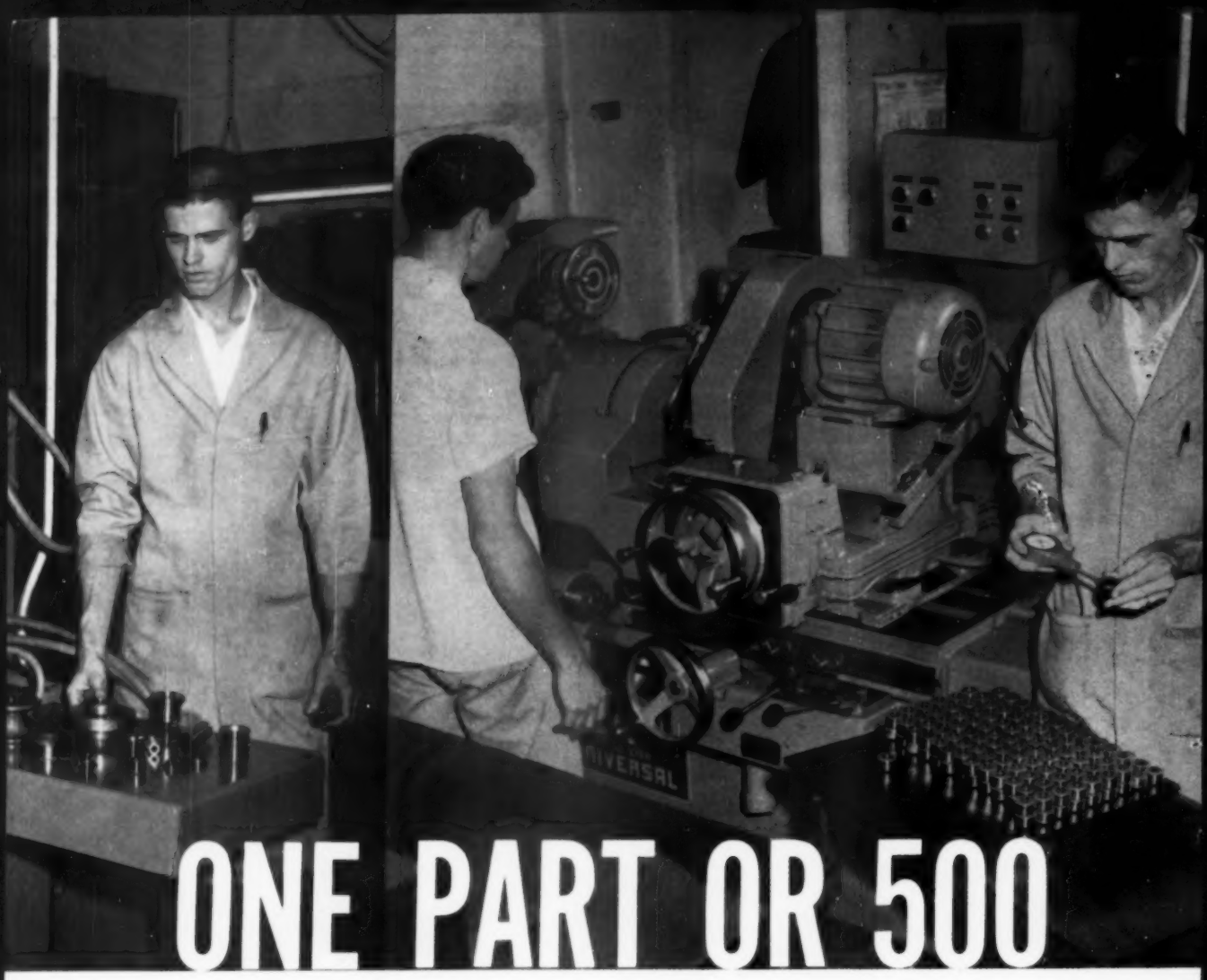


Stamping laminations for Chrysler's alternator—see page 114

First tooling details on the Valiant engine, page 93

Company-wide training for rural relocation, page 118



ONE PART OR 500

Selco gets top grinding performance at rock-bottom cost with the

NEW HEALD MODEL 273A UNIVERSAL

The Heald Model 273A Universal Internal Grinder shown above is installed at the Selco Grinding Company — a small but busy job shop in southern California. Here it is used to grind straight or tapered I.D.s and O.D.s, and for rotary surface grinding of flat, convex or concave surfaces of a wide range of work — from individual parts to production runs. And it easily handles every job with far greater speed, accuracy, precision and finer finish than could be obtained on any of their previous equipment.

Until the advent of this Universal Grinder, most small job shops (and many larger ones, too) couldn't afford a machine of this type. But the Heald 273A costs about *half* as much as comparable machines today, and less than similar machines (with fewer features) cost in 1947!

Incorporating the latest advances in the grinding art, it holds tolerances to within .0001" in routine production, and within .000050" in special cases. Features include hydrostatic antifriction ways, full 20" table travel, several wheelhead positions, infinitely variable workhead speed from 150 to 450 rpm and 90 degree workhead swivel for rotary surface grinding.

Ask your Heald engineer for information on the New 273A — the only completely new machine with 1959 performance and a 1947 price tag.

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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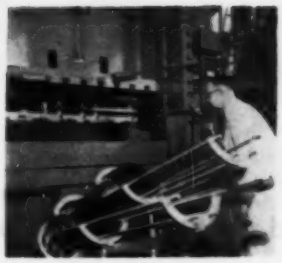
HEALD

It PAYS To Come To Heald

CIRCLE 151 READER SERVICE CARD

COVER:

Stator and rotor laminations for Chrysler's alternators and starter motors are blanked in pairs with $50,000 carbide dies. This 300-ton Niagara press operates at 120 spm. *See p 114.*



American Machinist

THE MAGAZINE OF METALWORKING MANUFACTURING

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CIRCLE 151 READER SERVICE CARD

METALWORKING REPORT

Significant current developments in tooling and production processes

CUTTING

Honing Follows Boring Directly

Among several new techniques applied by Chrysler on the production line for the slanted-6 engine that will power the Valiant, Dart, and Plymouth, one advanced idea is to have honing immediately follow boring in the engine-block cylinders. These operations are usually separated, but because honing can only smooth out the bore, and not correct any error of shape or alignment, immediate honing allows sooner bore inspection—to reduce expensive added operations if the work must be rejected. In addition, rough boring is done as soon as possible—to remove material from the block and allow it to stabilize early in the machining operations.

Another new idea is turning the main bearing diameters of camshafts on chucking machines. A new 6-spindle Acme-Gridley especially developed to center the work and take successive light cuts does rough and finish turning in one setup. These and other new techniques are described in the first technical article on tooling for the Valiant—see p93.

NC on Building Blocks

High-precision building-block machine made on special order by Ex-Cell-O is built something like a T-lathe, but the headstock is smaller in proportion and can be replaced. One head is for grinding templets set up on the long work table at right angles to the axis of the head. The other head is a workholder that rotates a part for turning or boring. One special feature is a pre-loaded ball-nut assembly that works from a leadscrew under the headstock to provide backlash-free head motion (for the grinder) or slide motion (for the lathe) in a direction perpendicular to normal table motion. Only 5½ lb of force will move the 1000-lb table slide. The cutting tool is set with a gage block. Accuracy for machining is within ±0.0001 in. Numerical control works from a zero point established with a Vernac gage. Electrical accuracy of the control system is better than ±0.00002ɔ in. (See page 97.)

FORMING

Cellular Extrusion

A six-cell aluminum extrusion measuring 24.190 in. wide by 2.485 in. high is now being produced in aluminum alloy 6061 by Harvey Aluminum, Torrance, Calif. The extrusion is fabricated into a modular cabinet-assembly component for an electronic control system.

The six-hole unit—each hole is rectangular—acts as both a containing unit and as a supporting member. The extruded shape replaces a built-up structure, cuts manufacturing costs, eliminates detailed assembly, and increases structural reliability. A 12,000-ton hydraulic press is employed to make the extrusion.

Extruded Beryllium

U-shaped beryllium parts ⅛ in. thick by 15 ft. long have already been extruded by the Norair Div, Northrop Corp., Hawthorne, Calif. The target—to produce 20-ft channels of the same thickness, because this length is the desired one for aircraft and space-vehicle parts.

Inherent stiffness and brittleness of beryllium have prevented successful extrusion heretofore. Norair specialists, working with engineers of Nuclear Metals, Inc, Concord, Mass, have compensated for the metal's brittleness by applying glass as the lubricant. Normally, smaller extrusions have been made with a steel cover to protect the metal from oxidation.

The billet is heated to 2000 F and forced through the dies at pressures up to 1700 tons. Work is now underway on alloying and heat treating the metal to improve its extruding and strength properties. Within two years, it is expected that extrusions in all sizes, shapes, and lengths will be available for aircraft and space-vehicle applications.

HEAT TREATING

High Strength + Ductility

A heat treatment that increases ductility at the same time that it increases tensile strength has been developed by William I Basset, III, of Research Development Corp of America, Gardena, Calif. SAE 4340 steel, for example, can be hardened to 335,000-psi tensile strength, 312,-000-psi yield, with 11% elongation, and 28% reduction of area.

Details on the process, on which patent applications have been filed, have not been disclosed, but it involves shorter furnace cycles than conventional practice, and probably includes magnetic fields imposed on the work during heat treatment. It does not depend on working the metal in the austenitic range or in special atmospheres, though atmospheres can be used to control scaling.

Result is a refined grain in the form of platelets, producing a structure free of the heterogeneous-sized grains which, in normally treated parts, serve as stress concentration points. Standard furnaces can be adapted to the process. Company is currently heat treating parts on contract, intends to license the process and lease the required equipment.

Die Quenching Cuts Warpage

Once warped, today's high-strength heat-treated steel parts are difficult to correct, simply because their high strength often rules out post-treatment machining or bending. Obviously, one answer lies in controlling the warpage; the most recent step in this direction is die quenching.

Die quenching relies on dies or

fixtures to hold the part to contour during the final phase of cooling. In some cases the die quenches the part; in others, both the die and part are quenched. Rohr Aircraft Corp, Chula Vista, Calif, reports success in die quenching such materials as 4130, 4340, H-11, type 410 stainless, and 17-7 PH.

One part, made from 0.031-gage 4130 steel, was quenched and formed at the same time, eliminating two separate forming operations. The flat blank was furnace heated to 1600 F, then rapidly transferred to a die in a small hydraulic press. In this particular case the die was rather expensive, because of matched steel forms, internal cooling, and locating pins. In most cases, however, the dies will not be used for simultaneous forming and can be much simpler and cheaper.

Die quenching is now being investigated as a method of controlling warpage during brazing and heat treatment of steel honeycomb structures.

INSPECTION

Taped Inspection

A new entry into the numerically-controlled inspection field is being made by Electronic Control Systems, div of Stromberg-Carlson. Based on the Digimatic 202 table with a special top that has reamed locating holes, the machine is automatic in two axes, manual in the third.

The machine records deviations from each dimension checked on a strip tape similar to those used with gear-checking machines. Parts 18 x 14 x 12 in. can be handled. Accuracy is said to be 0.001 in. on X, Y, and Z axes, and to 0.0005 in. on holes up to a 10-in. dia.

One complex aircraft part has been insepcted by the prototoype machine in 45 min/part, compared to 3 hr/part by conventional methods. Programming time was 8 hr, which should be sharply reduced when drawings have been made up for numerical control.

A later model will employ a probe with linear deflection instead of moving in an arc. This model will also have tape control of the third axis and of probe rotation.

WELDING

Improved Mig Welding for Magnesium

All-position welding of magnesium will be performed with open arcs and with the same operating freedom that aluminum has long enjoyed, according to C R Sibley of Air Reduction Sales Co.

Speaking at the Magnesium Association's annual meeting in New York, he stated that the major drawback at present is the excessively high melting rate of magnesium electrode wire in the Mig process (inert-gas metal-arc). However, laboratory tests show that the rate can be lowered by coating the wire with an emissive agent, a technique already successful with steel and aluminum. Next step is to develop a commercial method of applying a uniform and controlled amount of the emissive agent.

Another problem—short shelf life of magnesium electrode wire—has already been licked, Sibley claimed, by a new contact tube that puts proper current into the wire regardless of the oxide coating. Inside the tube are wires fastened at the inlet end and free to float at the outlet end. These transfer the current by a wiping action.

ASSEMBLY

Mechanized Shrink Fits

Ring gears can now be shrink-fitted to flywheels by a magazine-fed automatic induction heater. Flywheel blanks are gravity fed from a previous operation to the in-line machine element. Gears are fed by a slide from the bottom of the stack or from a conveyor, if desirable. Power is hydraulic and electric, with a 60-cycle tapped autotransformer supplying the induction power. Speed is 120 assemblies/hr. Shrinking is performed by air blast. Equipment is from Induction Heating Corp, Brooklyn.

Better Vacuum Brazing

Stainless-steel assemblies are brazed more rapidly and with more control over results with newly developed vacuum furnaces. Bendix Aviation uses such equipment to replace older box brazing, where the work had to be shut up completely and run through its heating cycle without any check on the work in progress. New furnaces have peepholes for inspection of the work, rapid heating cycles, and no extensive gas-handling equipment because hydrogen or inert gases are eliminated in the process. Much improved heating spread and speed offset the fact that the vacuum furnace must go through a complete heating and cooling cycle for each work load. See p110.

FINISHING

Primer Protects Against Sea Wtaer

For metals exposed to attack by sea water, a red lead-coumarone primer has been investigated by the Lead Industries Association, New York. A two-year test on the hulls of three destroyers indicates that the protection is at least as good as that provided by standard Navy primers, but at lower cost.

Recommended practice calls for a dry film thickness of 5 mils—obtainable with two or three coats—followed by a conventional antifouling coat. Primer should be applied to a surface sandblasted to bare metal, or over a standard pretreatment coat. The latter improves the bond and provides a slight improvement in over-all performance.

MATERIALS & COMPONENTS

Continuous Compacting

Large, uniform bars, strips, or sheets compacted of metal powder and unlimited in practical length are made commercially feasible by a new process. Developed by two Westinghouse Electric Co metallurgists, Charles Deibel and Frank Emley, the process permits fabricating large objects from tungsten, molybdenum, and other high-temperature-resistant metals and alloys. Powder to be compacted is continuously fed into a three-sided channel and pressed by a plunger descending from above. In the shape of a wedge, the plunger compacts the powder to a degree determined by the slope of the plunger face and the exerted pressure. The compact is moved forward slightly after every downstroke so that the following downstroke compacts the material further along. The result is

THE OUTLOOK

It will take many weeks, well into first quarter 1960, to balance steel supply with demand. Big customers (autos and appliances) will probably get first crack at it, while the smaller shops (who mostly get steel through warehouses) will continue to shut down until the situation eases (see p87).

METALWORKING REPORT...

a uniform, tightly compacted bar of metal. Dr C E Arntzen, manager of Westinghouse materials engineering departments, said continuous bars 2 in. thick by 12 in. wide have been produced experimentally.

Ablation the Answer

An ablating heat shield of plastic or ceramic, rather than a beryllium heat sink, will be used on man-carrying Project Mercury space vehicles. The decision was announced by Mac C Adams, deputy director of the Avco-Everett Research Laboratory (Everett, Mass), in commenting on a paper he presented at the International Symposium on High Temperature Technology. Ablation means heat is absorbed by vaporization or melting of the material itself.

RF Power Transistor

Transistor-development engineers at Bell Laboratories have developed a transistor that operates at 10 megacycles with a power output of five watts. While initially intended for radio-transmission applications, and only the bottom rung in the ladder of power transistor development, this device probably foretells a significant change in the design and application of tomorrow's industrial induction-heating equipment.

MATERIALS HANDLING

Load-Sheet Retriever

In palletless handling, a major disadvantage is that the load-carrying sheet can't be recovered at once, because there is usually no method of pulling the sheet out from under its load. A new fork-truck attachment from the Industrial Truck Div of Clark Equipment Co promises to overcome this difficulty.

Called the Model 5000 Sheet Retrieving Pul-Pac, the attachment retrieves the sheet either by pulling it from under its load or by pushing the load off the sheet.

To pull a load-carrying sheet onto the truck's forks, the operator opens gripper jaws, automatically connecting the jaw and pusher rack so that they operate simultaneously. Pusher rack and jaw then are extended to the desired point and the jaw is closed on the sheet. To pull sheet onto the forks, the pusher rack and jaw are retracted. When pusher rack and jaw are fully retracted, the jaw automatically latches onto the main frame of the attachment, so that rack and jaw operate independently.

At the unloading point, the pusher rack is extended while the jaw remains retracted and closed on the sheet. This action pushes the load off the sheet. Or the operator can place the load in the final desired position, with the jaw gripping the sheet, and extend the pusher rack. This in effect pushes the fork truck away from the load.

MANUFACTURING CONTROL

Electronic Teacher

The Tutor (a "teaching machine" developed by Western Design Div of US Industries, Inc) projects any of 10,000 frames of 35-mm film on an 8-by-11-in. screen. Designed primarily for use in industrial training courses, the machine asks questions, answers them, and records and times the student's progress—all without the aid of outside help.

To get any of 10,000 questions, all the student does is punch numbers on a keyboard adjacent to the screen. Question and answer sequence is as follows: A multiple-choice question flashes on the screen, together with possible answers (each followed by a code number). If the student punches the wrong answer on the keyboard, the frame that flashes into view tells him that he is wrong, then expands on why his choice was incorrect. If he punches the correct code number, the screen congratulates him, then moves him along to the next area of material to be learned.

Thus the machine develops the student's understanding of a subject step by step, at his own pace, making sure at each step that he has grasped the point presented.

Physical elements include the film bank, automatic sequence and projection apparatus, selector buttons, viewing screen, and a tape-printing mechanism that records the student's progress.

The Tutor is an important new approach to industrial training, if training courses can be put on film in the proper manner. Cost per unit, ordered in moderate amounts, is $6500.

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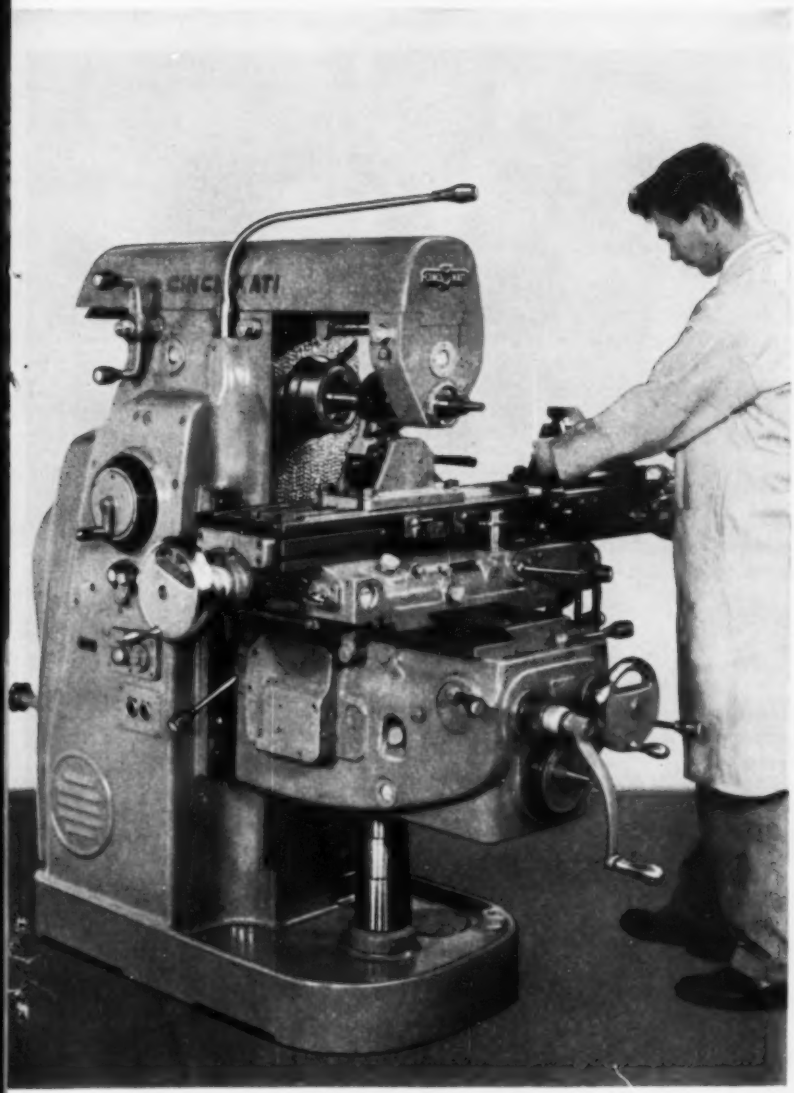
MI Reciprocating Cycle Stops Automatically

Cincinnati's dependable performance

continues for Years



ALMOST CONTINUOUS MILLING with right- and left-hand fixtures . . . a strong plus value offered by CINCINNATI ML and MI Plain and Vertical Milling Machines equipped with Automatic Table Cycles.

Many shops are benefiting from the extended range of productivity incorporated in Cincinnati knee and column type milling machines. This highly desirable type of "range," obtained through automatic table cycles, augments the wide variety of short run toolroom operations which Cincinnati performs so well. All members of the MI family, the finest toolroom machines in the 3 to 10 hp class, are available with or without automatic table cycles. And when equipped with this productivity feature, an exclusive, cost-reducing advantage is included: *Automatic reciprocating milling with center safety stop.*

Just think what this means to you in low-cost production! You can set up a fixture at each end of the table, and mill the part in one while the other fixture is being loaded. To protect the operator, cycle automatically stops midway between the fixtures. This exclusive advantage is brought about by the automatic backlash eliminator device built around the table feed screw. It and other Cincinnati feature-advantages are illustrated on the following two pages.

Only Cincinnati Milling gives you so many exclusive features and the completeness of integration which assures dependable productivity. Ask for MI Milling Machine Catalog No. M-1995-3. **Milling Machine Division. The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES
• CUTTER AND TOOL GRINDERS • ELECTRICAL DISCHARGE MACHINES

CINCINNATI®
MILLING MACHINE DIVISION

You'll benefit from these CINCINNATI cost reducing Feature-Advantages

It's a pleasure to see the smooth cutability of CINCINNATI ML and MI Milling Machines. Built for medium-duty work (3 to 10 hp), they take cuts at full power with never a sound of strain. And they're equipped to give the operator a fast start . . . a prime consideration for your toolroom equipment. Some of the feature-advantages which give the MI line the highest rating for variety and production work are illustrated here. Others include: • Independent and directional feed control levers. • Extra large micrometer dials; the quickly set, pull-out type. • All hand cranks automatically disengage in power feed. • Live rapid traverse, 150 ipm. • And for vertical machines, power feed and rapid traverse to the vertical head, including four-position turret stop.

No other medium-duty knee type milling machine combines so many toolroom feature-advantages with the production possibilities of automatic reciprocating table cycles.

CINCINNATI DIVIDING HEAD is a highly precise attachment for milling gear teeth and for other toolroom and production work. It is standard equipment on all ML and MI Universals.

BUILDERS OF FINE MACHINE TOOLS: KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES •

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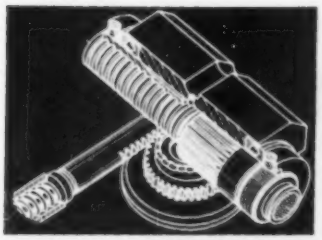
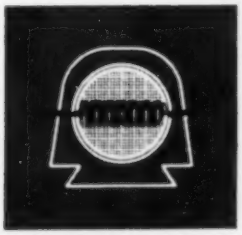
and the Dependability of the MI Line



AUTOMATIC BACKLASH ELIMINATOR operates without attention. There is always a snug fit between feed screw and nut for "climb" milling. This is a standard feature-advantage exclusive with Cincinnati.



DYNAPOISE OVERARM damps self-excited chatter; increases feed rate for troublesome jobs. This is another standard feature-advantage exclusive with Cincinnati.

ARBOR-LOC spindle nose is still another exclusive Cincinnati feature, standard on all ML and MI Milling Machines. Arbor-Loc helps operator change cutters safely and quickly (in 20 seconds or less).

Cincinnati Milling builds dependable performance into every machine bearing the Cincinnati trade-mark. This highly desirable characteristic is evident in two ways: 1) the finest construction features to ensure long productive life without interruption; and 2) the Company's unusual degree of integration. Extensive and complete foundry operations, for example, give Cincinnati precise control over every cast iron part. Gear machining and heat treating facilities are a revelation to visitors.

May we give you more information? Ask for Catalog No. M-1995-3, or a visit by one of our field men.

	Style and Size	Spindle Drive (hp)	Table Travel
PLAIN	203-10 ML	3	28"
	205-10 MI	5	28"
	307-14 MI	7½	34"
	410-14 MI	10	42"
UNIVERSAL	203-10 ML	3	28"
	205-10 MI	5	28"
	307-14 MI	7½	34"
	410-14 MI	10	42"
VERTICAL	205-10 MI	5	28"

Catalog No. M-1995-3

CINCINNATI

CUTTER AND TOOL GRINDERS • ELECTRICAL DISCHARGE MACHINES

CINCINNATI
MILLING MACHINE DIVISION

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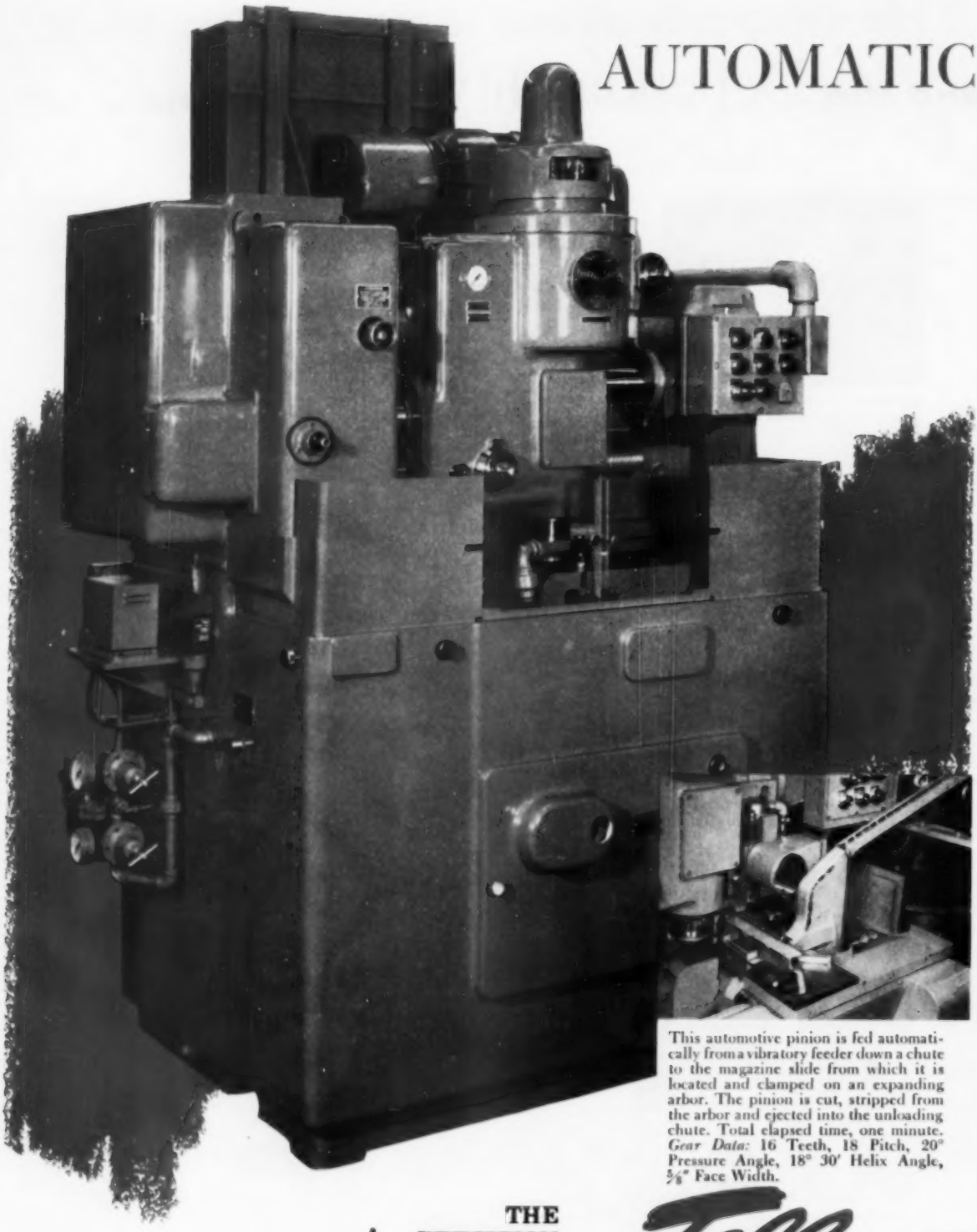
AUTOMATIC



This automotive pinion is fed automatically from a vibratory feeder down a chute to the magazine slide from which it is located and clamped on an expanding arbor. The pinion is cut, stripped from the arbor and ejected into the unloading chute. Total elapsed time, one minute. *Gear Data:* 16 Teeth, 18 Pitch, 20° Pressure Angle, 18° 30′ Helix Angle, 5/8" Face Width.

THE PRECISION LINE

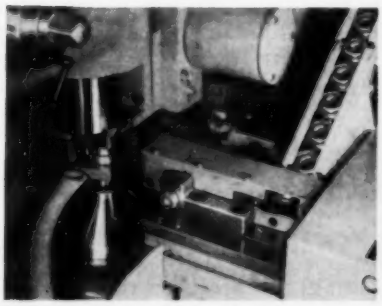
Fellows

WORK HANDLING
Is A Natural Complement to the High Production Rates of the Fellows 4GS Gear Shaper

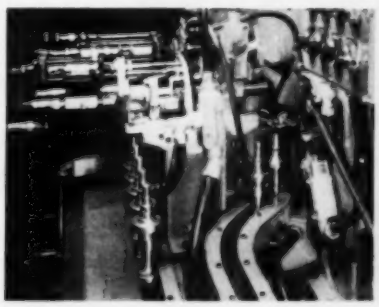
Although designed for both manual and automatic loading, the 4GS Fellows Gear Shaper makes best use of its high production rates when equipped with work handling devices.

The physical construction of the machine is such that it may be easily adapted for use with magazines and chutes for automatic loading and unloading at substantial cost savings on continuous production runs.

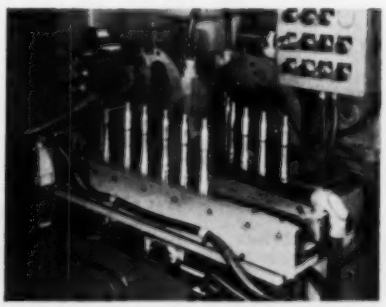
Ask your Fellows representative about the many advantages of automatic work handling with the 4GS Fellows Gear Shaper, or write direct to the Fellows Gear Shaper Company.



These internal clutch parts are handled in the same manner as the 16-tooth external pinion, except that the cutter-spindle is automatically stopped at the top of its stroke for clearance during the loading and unloading cycle. Cutting time is 1½ minutes. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, Spur, ⅝" Face Width.



This transmission cluster gear shaft is handled by two sets of air-operated "fingers" mounted on a turret. As the turret rotates, one set of fingers moves the finished piece to the unloading chute while the other set brings the new blank into position. Cutting time is 35 seconds. *Gear Data:* 10 Teeth, 12.4 Pitch (Stubbed), 30° Pressure Angle, External Spur, ⅝" Face Width.



This automotive stem pinion is handled in the same manner as the cluster gear. In both cases, safety devices prevent the machine from starting unless the blanks are in the correct cutting position. Loading and unloading chutes may be hand or conveyor fed. Cutting time is 2½ minutes. *Gear Data:* 17 Teeth, 10 Pitch, 19° 30′ Pressure Angle, 32° 51′ Helix Angle, ⅝" Face Width.

Gear Production Equipment

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont, U. S. A.
Branch Offices:
1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manshester Ave., Los Angeles 45

rolling taper pipe threads

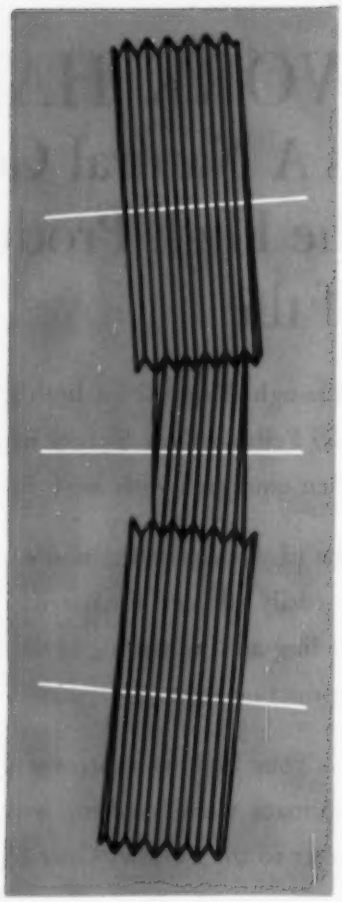
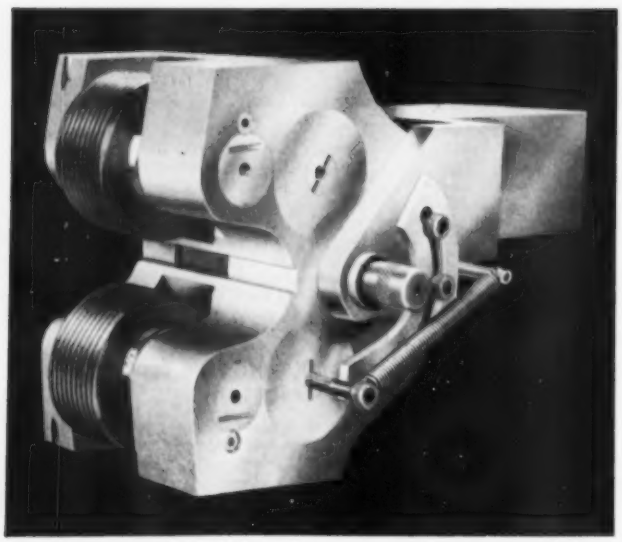


Figure 1

with the LANROLL thread rolling attachment



Thread-roll wear is minimized by the recently developed LANDIS Method (Patents Pending) for precision rolling of taper pipe threads (including dry-seal).

To produce the taper, the rolls of the LANROLL Attachment are supported on carbide shafts inclined to the required thread taper. This design enables the use of parallel rolls (see Figure 1) which reduces slippage between the workpiece and the rolls. With reduced slippage, roll life is materially increased. In addition, attachment stabilization (limited sidewise movement)

470-C

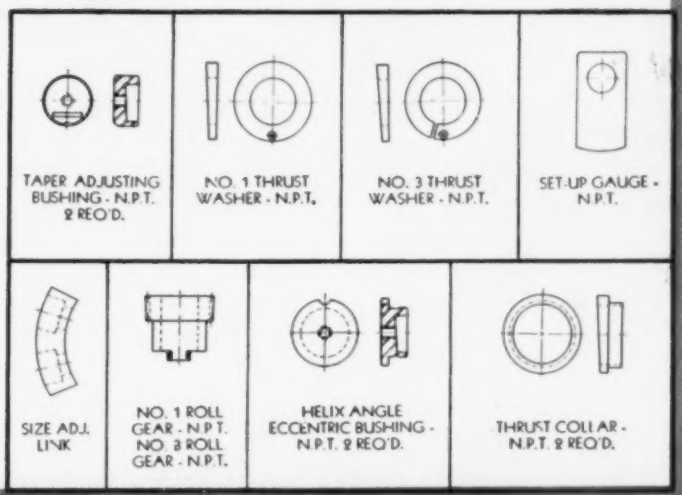
is greatly improved to permit rolling directly to a shoulder with safety.

Of an adjustable design, the LANROLL Attachments provide wide range coverage while retaining the rigidity of a non-adjustable tool. Either straight or tapered threads can now be produced with the same attachment through the use of proper rolls and auxiliary equipment. Five sizes with varying dimensions are available for use on the many sizes and makes of bar automatics, and will produce coarse pitch threads to Class 4 tolerances on all diameters from #5 to 1¾" for straight threads, and precision pipe threads from 1/16" to 1¼" in diameter.

In addition to proper rolls, the auxiliary equipment necessary to change from straight to taper threading is negligible, as illustrated in Figure 2. When changing from one pipe size to another within the range of the attachment, the size adjusting link, set-up gage and rolls are the only equipment changes required. With this design tooling flexibility is obtained with minimum cost. These changes assure operation of the attachment for every size within its range as though it were exclusively engineered for the particular work being threaded. Also, the same simplified and precise methods of set-up and roll timing used for straight threading are used for taper threading.

For additional information ask for Bulletin G-96 and specify straight or taper work.

Figure 2


TAPER ADJUSTING BUSHING - N.P.T. 2 REQ'D.
NO. 1 THRUST WASHER - N.P.T.
NO. 3 THRUST WASHER - N.P.T.
SET-UP GAUGE - N.P.T.
SIZE ADJ. LINK
NO. 1 ROLL GEAR - N.P.T.
NO. 3 ROLL GEAR - N.P.T.
HELIX ANGLE ECCENTRIC BUSHING - N.P.T. 2 REQ'D.
THRUST COLLAR - N.P.T. 2 REQ'D.

longer roll life with LANDIS parallel-roll method

Note that in producing a taper thread one end of each roll is required to thread a larger diameter than its opposite end. This results in unequal circumferential travel by the respective roll ends during each revolution. However, in traveling these unequal distances both ends of the roll make a revolution in the same interval of time. Therefore, the end of each roll on a large thread diameter must travel at a higher peripheral velocity than its opposite end on the small diameter. These necessary differentials in peripheral velocities for the roll ends can only exist by slippage between the roll and the workpiece. This slippage becomes more acute on the larger diameters as the differentials become greater or where tapered rolls on parallel axis are used. **By presenting parallel rolls to the workpiece, the LANDIS Method (see Figure 1) reduces the differentials in peripheral velocities and its accompanying roll slippage.** Roll life, of course, is greatly benefited by any reduction of slippage.

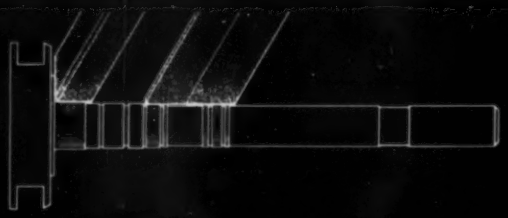
In developing a roll diameter for a particular thread, the pitch diameter of the workpiece is used as a basis. If the workpiece is straight, the relationship of the roll diameter to the workpiece diameter remains constant. For taper threads the roll diameter is normally developed from the pitch diameter at the mid-point of the effective thread. Thus, the diameter of the roll thread in respect to the diameter of the workpiece thread will only agree at one point. On either side of this point the roll diameter will be either too large or too small. This disagreement in the roll and workpiece diameter relationship results in attachment instability (sidewise movement). Maximum instability occurs if taper threads are produced with tapered rolls on parallel axis as the relationship of the roll and workpiece diameters vary in direct opposition. This instability becomes more apparent on the larger diameters as wider thread rolls having a greater disagreement are required to produce the longer thread lengths. **By use of parallel rolls on inclined axis (see Figure 1) the LANDIS Method reduces disagreement in the relationship of the roll and and workpiece diameter by one half.** In this case, both ends of each roll have a pitch diameter equal to the P.D. from which the roll was developed. Improved attachment stabilization results and rolling to a shoulder can be accomplished with safety.

LANDIS Machine COMPANY WAYNESBORO PENNSYLVANIA

new

Landis R plunge

automatic production grinder



New Landis R Plunge Grinder automatically grinding 3 diameters and face of 100 transmission shafts per hour with dependable accuracy.

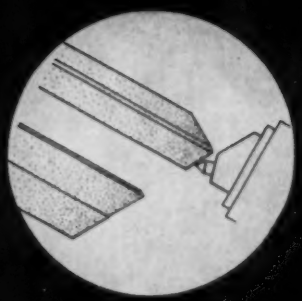
grinder

for consistent "tenths" tolerances

...completely new concept in production grinder design now gives you these new features for lower production costs

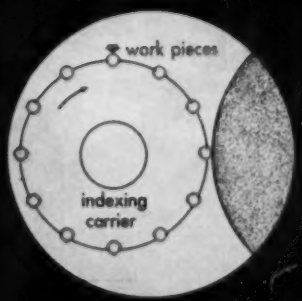
Landis MICROFEED—a new feed, symbolized by this mark, that guarantees "tenths" tolerances on a production basis

- automatically compensates for wheel wear and machine temperature variations
- eliminates costly rejects and reworking
- easy-to-set feed reduces set-up time



TRUFORM—a new dresser for accurate duplication of the profile to the wheel

- mounted on pre-loaded steel balls, to keep friction to a minimum for easy movement and accurate dressing
- dresses profiled wheels with angles up to 60°
- pushbutton control assures uniform dressing cycles



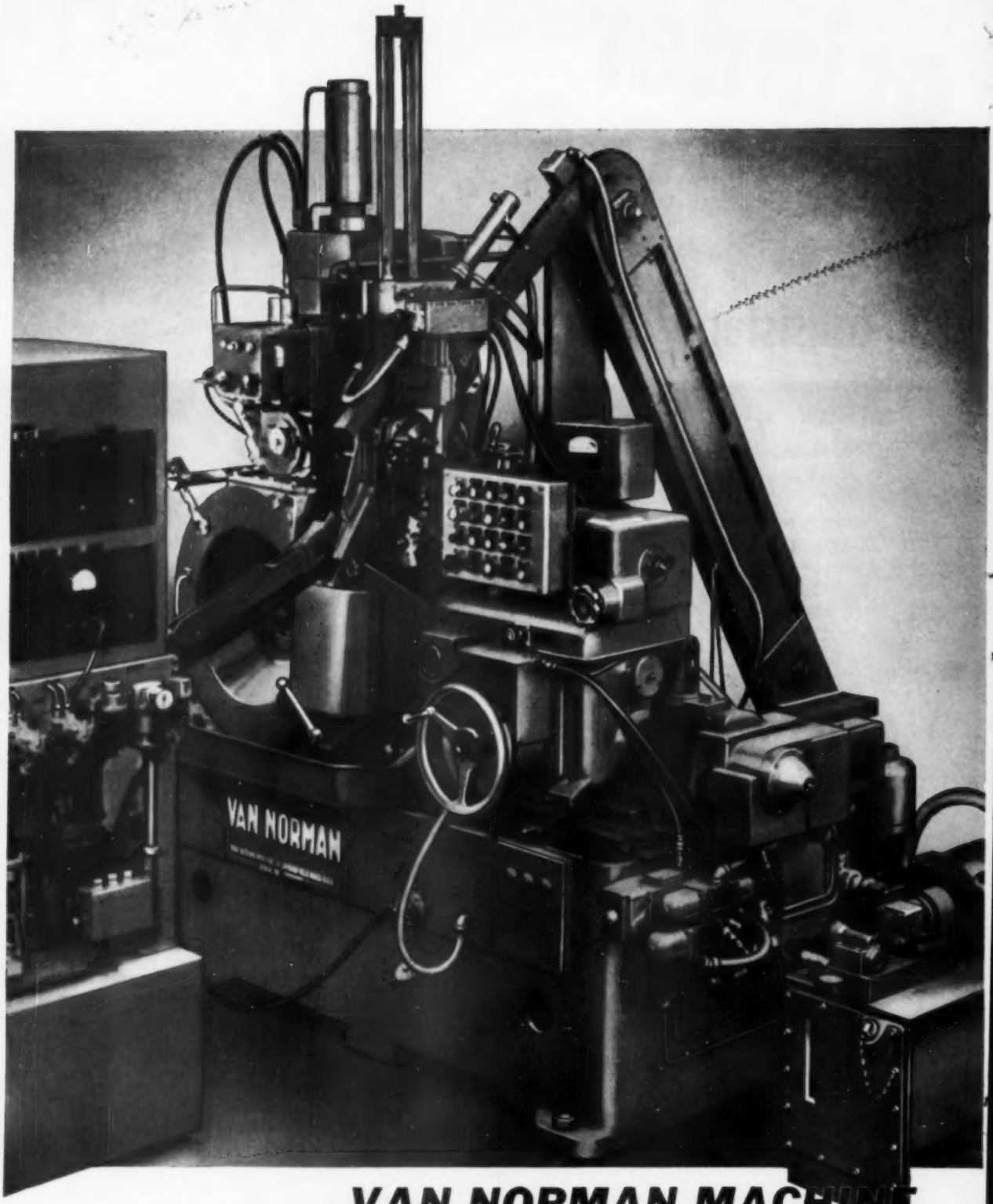
NEW Landis design assures stability and convenient maintenance

- new design box bed allows use of high production indexing rotary loader
- coolant, oil and valves outside bed
- automatic lubrication
- meets J.I.C. electrical and hydraulic standards
- automatic lateral location of work

LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA



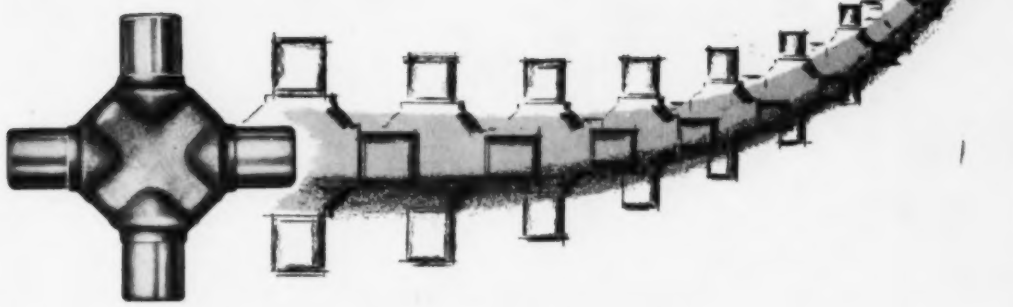
VAN NORMAN MACHINE

SPRINGFIELD 7, MASSACHUSETTS

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

Automotive Parts Manufacturer . . .

BOOSTS PRODUCTION more than 100%



WITH THE VAN NORMAN 2C DIVERSIMATIC CENTERLESS

A leading Detroit auto parts maker had a problem. He was producing close tolerance universal joints — very satisfactorily as to finish *but* only at the rate of from 70 to 170 per hour. He needed greater production.

His solution?

Van Norman 2C Diversimatic Centerless Grinders.

The result?

This manufacturer is now turning out 250 an hour. *And*, when these precision parts leave the Van Norman 2C Diversimatic Centerless, they are completely ground and gauged to tolerances of .0003 of an inch or less.

What made this possible?

Van Norman design and engineering know-how which enabled them to produce a 2C Diversimatic, equipped with crush dresser, a special loading and indexing fixture, in conjunction with a special non-mar hopper belt loader and gauging device.

This is but one more example of how Van Norman helps tool engineers throughout industry reduce production costs. We welcome an opportunity to help *you* reduce your cost. Send in your specifications for a cost-saving Van Norman quotation.

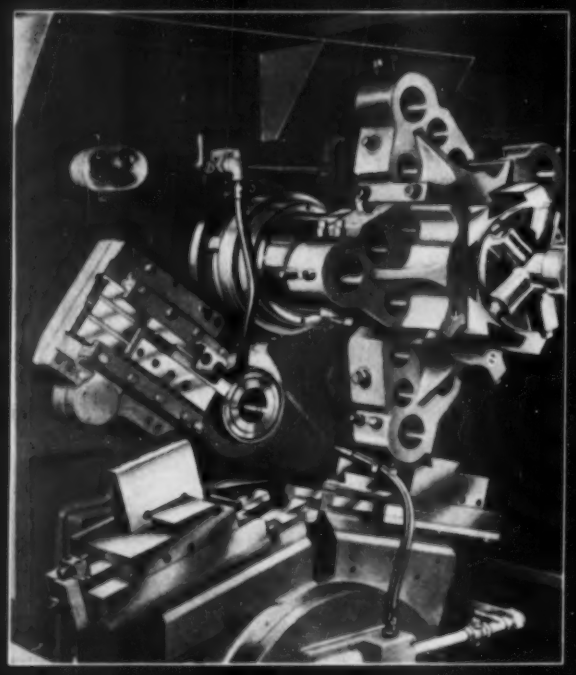
COMPANY
A DIVISION OF
VAN NORMAN INDUSTRIES, INCORPORATED

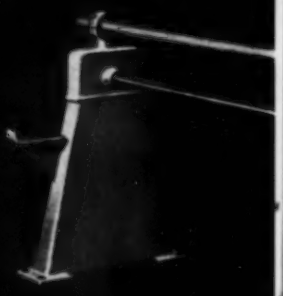
Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years. Conditional Sales Contracts not available to Export.

*T.M. Reg. U. S. Pat. Off.

NEW! WARNER & SPINDLE

...enables profitable small-lot production of even your most complex and precision-demanding bar jobs on a fast, automatic basis





This new 2AB machine has a 3-inch diameter bar capacity and a 9½" working stroke. A unique all-clutch speed transmission eliminates changing speed pick-off gears and provides two ranges of six automatically selected speeds: From 120 to 1544 rpm in the High Range, and 56 to 728 rpm in the Low Range. Right or left-hand threads can be cut from 7 to 32 tpi. Six automatically selected feeds are available from a 36 feed range (.0019" to .124") in addition to six independent cutoff feeds ranging from .0015" to .020".

Now, the shop-proven, cost-cutting features which have made Warner & Swasey Automatic Chuckers so outstanding in their field are available in a new Single Spindle Bar Automatic. Most important among the profit-producing features of this new Warner & Swasey 2 AB are:

● **FASTER SETUPS**—With no cams to change, time-consuming set-up procedures, usually encountered with automatic bar machines, are eliminated. Even your smallest lot bar jobs can now be produced economically on an automatic basis.

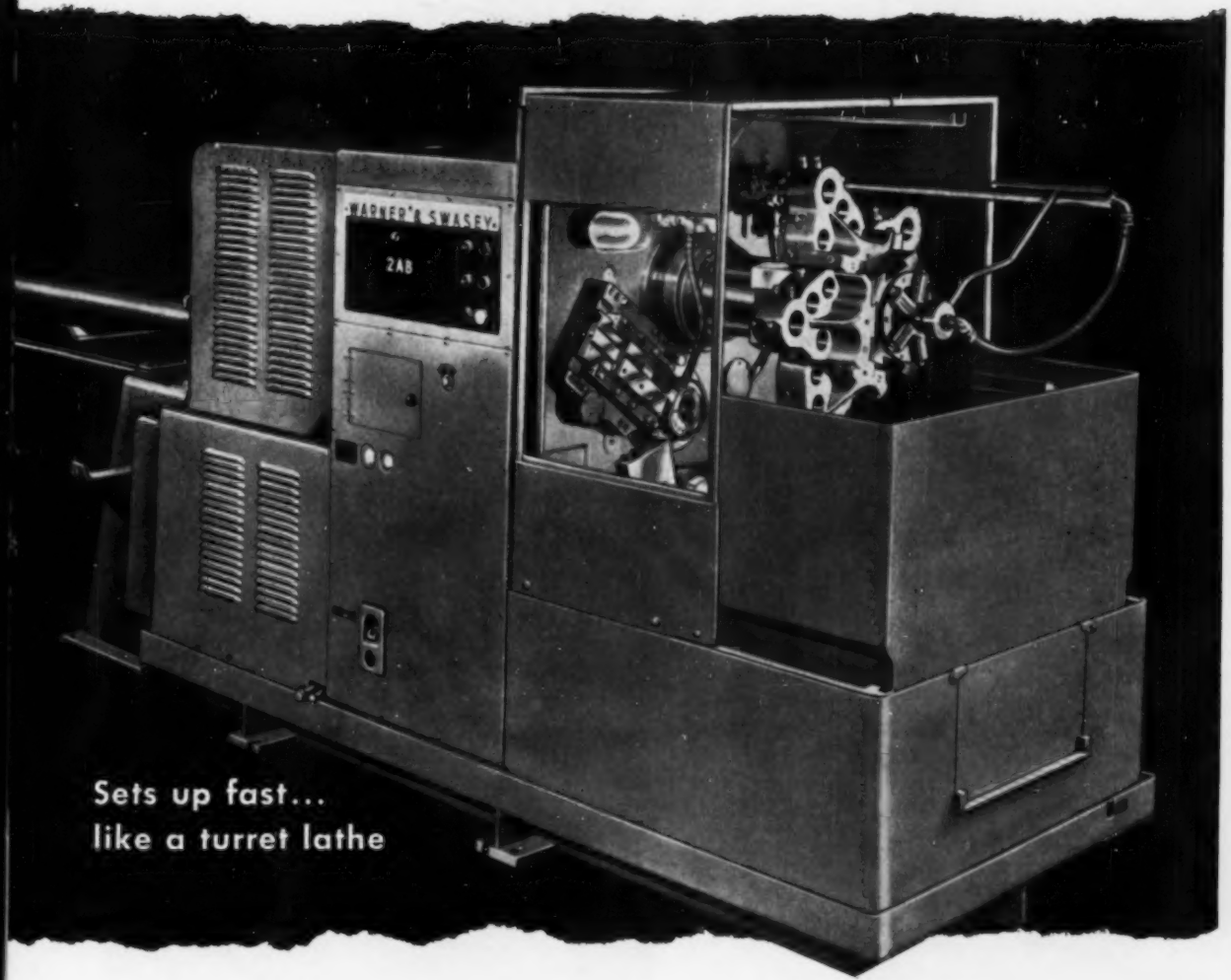
● **GREATER ACCURACY**—Only two wide—and widely-spaced—bearing surfaces support the turret. Thus, cumulative tolerance problems in conventional "multiple bearing" turret location designs are eliminated.

● **EASIER TOOLING FOR COMPLEX WORK**—Flexibility and accessibility of the 2 AB's cross slides and pentagon turret enable the use of a wide variety of machining methods. One operation usually handles even the most complex workpieces.

● **POWER FOR TOMORROW'S JOBS—TODAY**—The 2 AB's 25 horsepower, reversible motor more than meets today's rugged metal removing requirements and, coupled with a wide range of spindle speeds, permits the efficient application of the latest cutting tool materials.

● **"FREE" CUT-OFF TIME**—An independently-operated cut-off slide allows full utilization of both front and rear cross slides. The cut-off cycle may be started during

SWASEY 2AB SINGLE AUTOMATIC BAR MACHINE



any one of the pentagon turret stations. Thus, cutoff can be progressing during subsequent machining providing a cut-off cycle which is virtually "free".

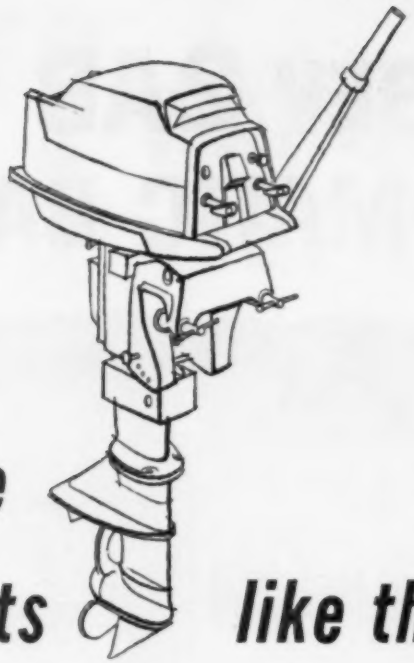
● **AUTOMATIC RESTOCKING INDICATOR**—This ingenious device in the hydraulic bar feed mechanism automatically stops the 2 AB and lights an indicator light on the operator's control panel before the bar being machined runs out—prevents tool damage from improperly-gripped stock.

Why not call your nearest Warner & Swasey Field Representative and get the complete story on the new 2 AB. It can help increase both production and overall profits—so important in today's highly competitive picture.

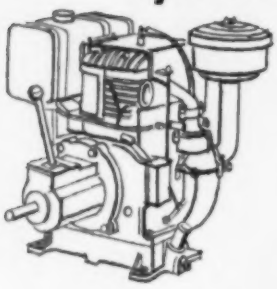
WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

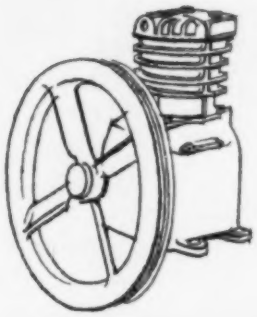
NO MATTER WHICH WAY YOU TURN
...WARNER & SWASEY CUTS COSTS

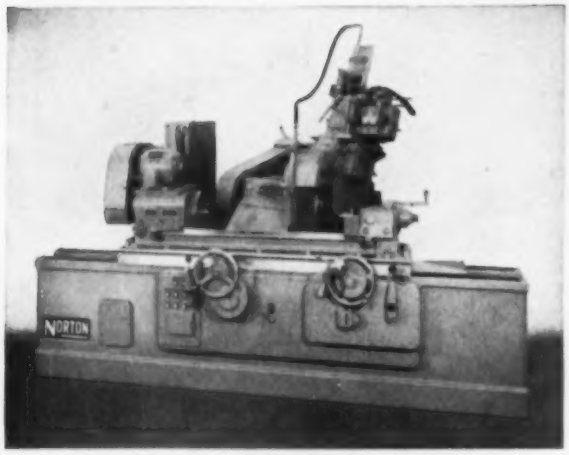
CIRCLE 166 READER SERVICE CARD



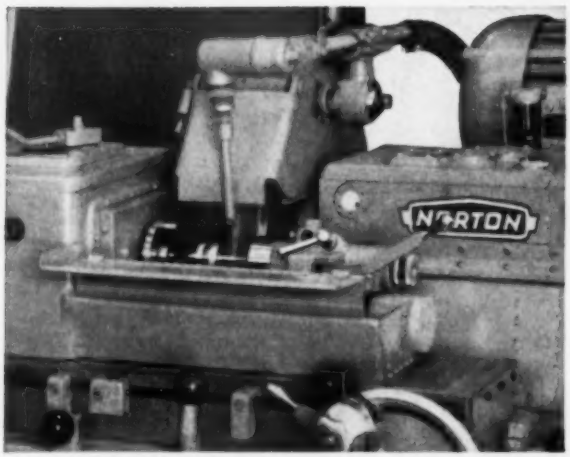
If you make products like these.....





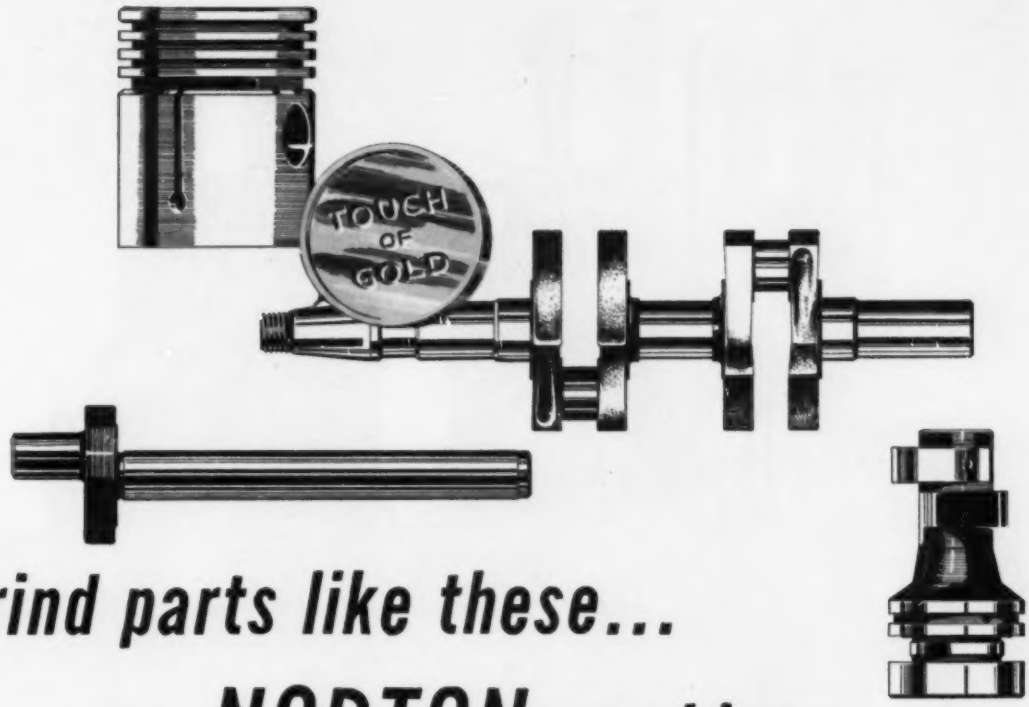


A Norton Type CV-4 Angular Wheelslide Grinder, 10" semiautomatic, grinds the bearing diameters and adjacent shoulders of the outboard engine crankshaft shown above. Two other Norton machines are used in grinding this part: a 10" Type LCTU for the center main bearing and a 10" Type CTU CRANK-O-MATIC* crankpin grinder for the throws.



A Norton CAM-O-UNIT* Mechanism attached to a Norton Type CTU cylindrical grinder. This smooth-working grinding team broadens the scope of a proved cylindrical grinder, assuring excellent, low-cost grinding of the small piston and the motorcycle camshaft shown, as well as other special shapes.

*Trade-Mark Reg. U.S. Pat. Off. and Foreign Countries



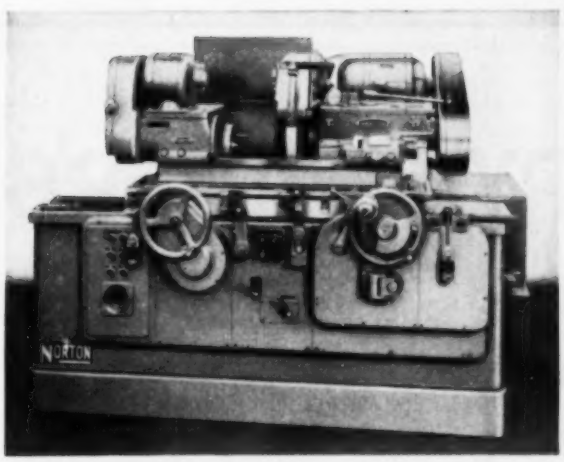
grind parts like these... on NORTON machines

The longer it takes you to grind parts for popular, mass-produced products, the more it costs you. If your grinding machines are below par, so are your profits.

Norton grinders can help you cut production time and costs to the very lowest. You have plenty to choose from — cylindrical, angular, crankpin and other grinder types, together with CAM-O-UNIT mechanisms that enable CTU machines to grind cams and special shapes with precision accuracy.

Norton grinders — all of them — are engineered for fast, accurate, easy operation, simplified maintenance and long, trouble-free service life. By combining several grinds in one job, a single Norton machine for your production can easily replace two or more ordinary grinders.

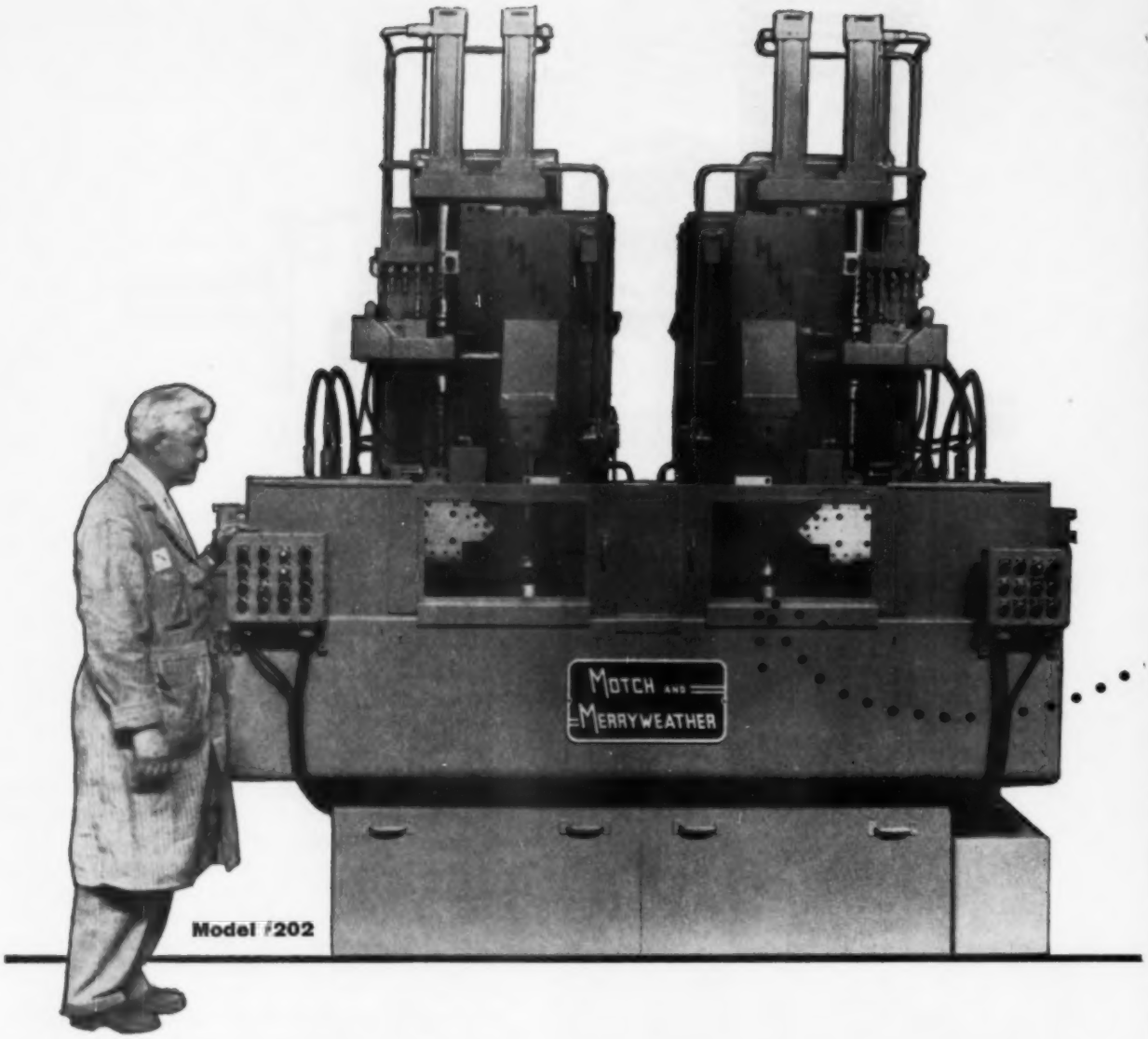
Your Norton Man, an expert grinding engineer, is always ready to help you select the grinding equipment you need to improve product quality and build your profits. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.



A Norton Type CTU Cylindrical Grinder, 6" x 18" semiautomatic, with live spindle headstock, is used for grinding the household refrigerator compressor shaft, shown above. Areas ground are the short off-set diameter, the shoulder and part of the shaft — typical of the Type CTU's ability to perform several grinding operations at one time.

NORTON
GRINDERS and LAPPERS
Making better products . . .
to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electro-Chemicals — BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

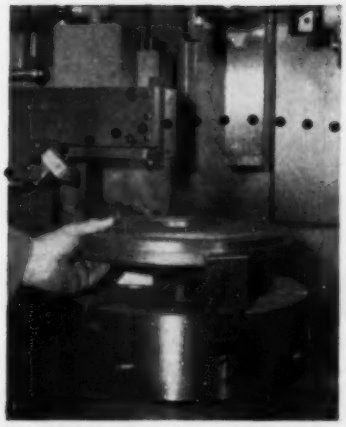


MOTCH & MERRYWEATHER'S

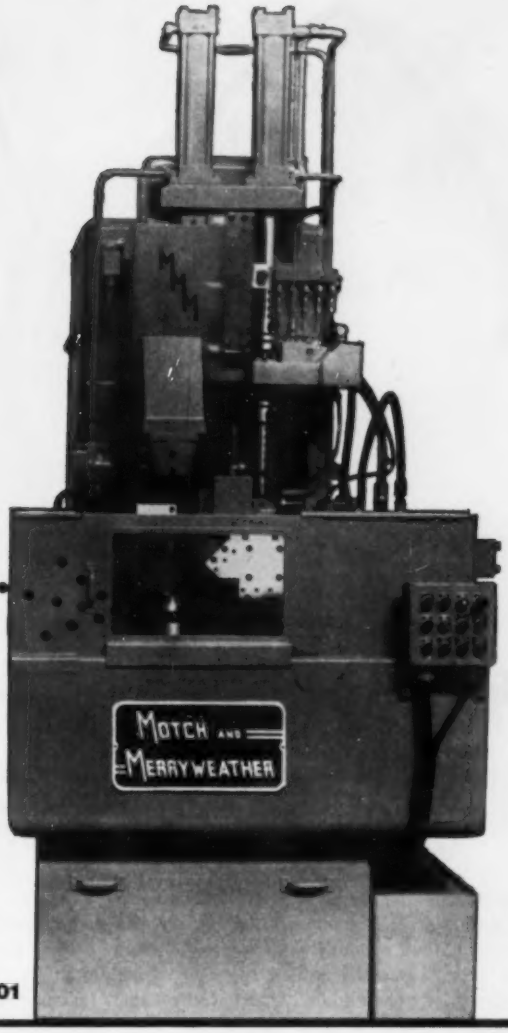
...add flexibility to standard machining operations

Here's a machine tool designed for precision turning, boring and facing operations with versatility for long and short run production jobs. Features:

- **spindles will accommodate any type chuck including air operated draw bar (20" swing) —spindle speeds adjustable.**
- **automatically-lubricated tool slides.**
- **slide ways of hardened and ground steel with tapered gibs for accurate alignment and easy adjustment.**
- **hardened adjustable slide stops.**
- **hydraulic or cam-actuated slide-feed, rapid traverse and rapid return.**



Boring, facing, and turning—to 20" —is accurately handled on the new M&M Series #200 Vertical Turners.



Model #201

#200 VERTICAL TURNERS

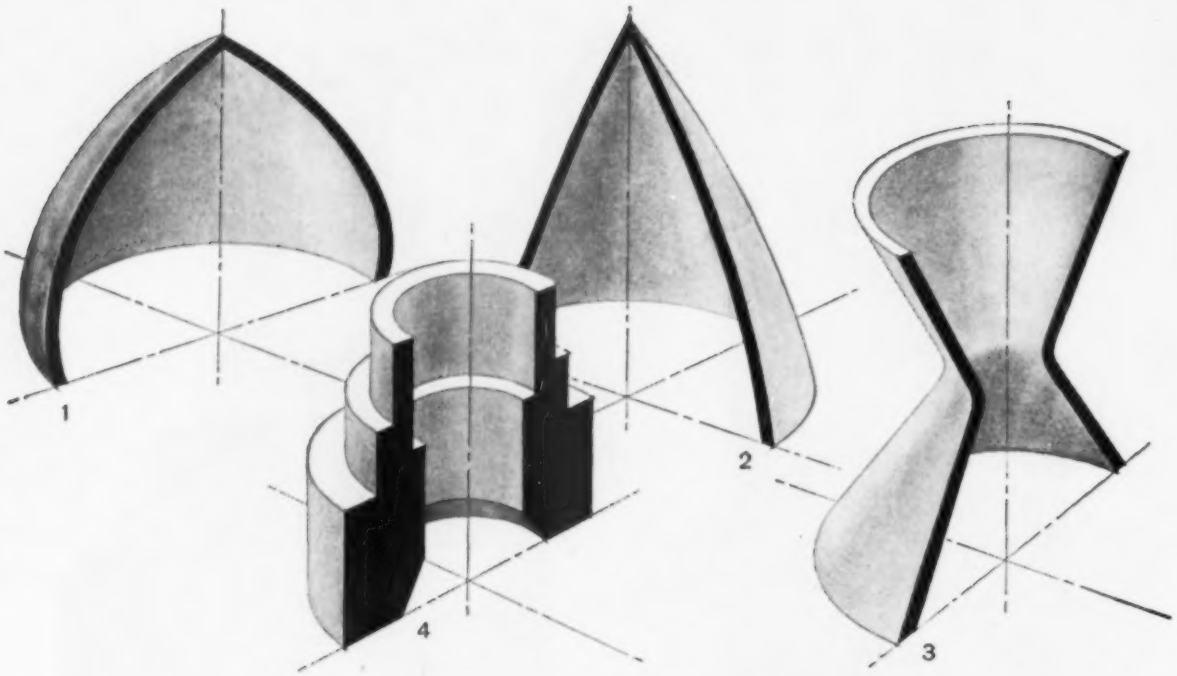
- separate controls for each spindle and slide unit to permit their independent operation on two-spindle machine (single spindle machines available).
- on four-spindle, two column machine, spindles are controlled in pairs, separate controls for each pair.
- "building block" design for easily-made tooling and slide changes to accommodate a wide variety of work.
- design features accessibility for simple, speedy maintenance of spindles, motors, hydraulic cylinders and/or cams and slides for minimum downtime.
- three position automatic turret available for boring, counter-boring, etc.

We can show you, in detail, how this new adaptable metal-working machine will improve your present machining operations. Call your nearby Motch & Merryweather representative, or write: Motch & Merryweather Machinery Company, 1250 East 222nd Street, Cleveland 17, Ohio.

MOTCH AND MERRYWEATHER

Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, DRILLING AND SPECIAL MACHINERY



how to Vertical Grind missile shapes

Complex missile shapes such as these, weighing hundreds or thousands of pounds, can be ground accurately on a Springfield vertical contour grinder. These machines are equally at home grinding ceramics, plastics, metals or combinations of materials. Domes (1) of any shape or Cones (2) demanding extreme concentricity can be contour ground on a Springfield. Ceramic coated parts (3) or complex orifices (4) are naturals for grinding on a standard Springfield vertical.

If your missile shapes, *no matter what size,* require contour grinding or have taper holes, irregular holes, offsets, undercuts or angles—we'd like to show you how the Springfield principle of vertical grinding can work for you. Mail the coupon today, for your free and informative copy of "Vertical Universal Grinders"; Bulletin 197-E.

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

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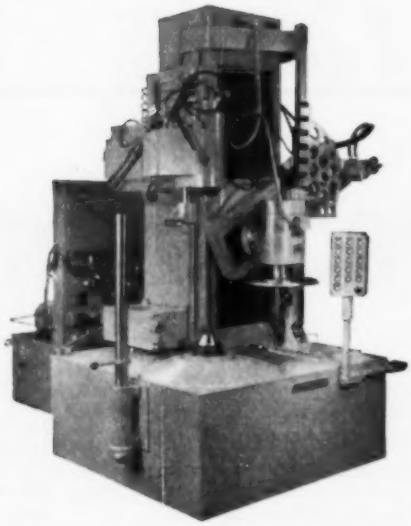
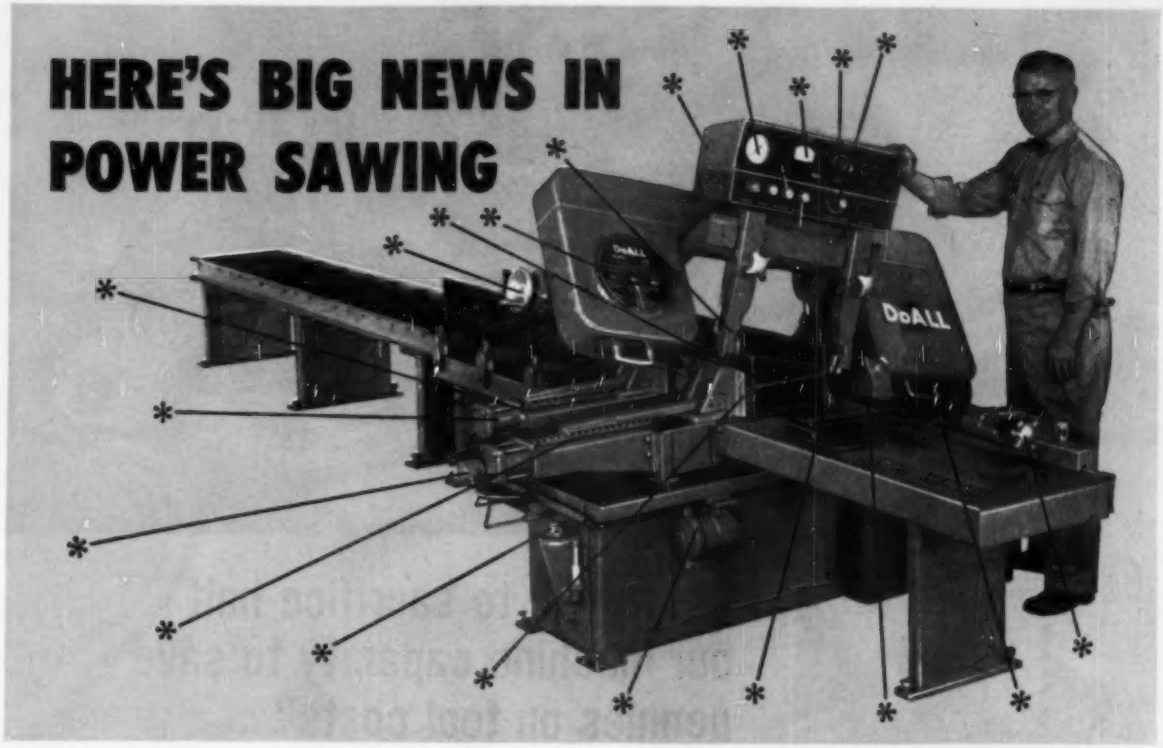


This machine accurately grinds a compound-curve dome. Both the grinding wheel and a single point tool follow a precision template. Automatic parting tools remove excess stock, top and bottom.

HERE'S BIG NEWS IN POWER SAWING



TWO NEW MODELS with 20 NEW FEATURES

for Easier, More Productive Cut-off Sawing

Already the world's fastest automatic cut-off saw, now made even better! Some of these new features are:

NEW CONTROL CONSOLE—Human Engineering design for operation from left or right position. All operating controls grouped for natural sequence of operation.

NEW SELF ADJUSTING TOOL GUIDES—completely eliminates tedious adjustment for exact band support. Hairline accuracy maintained by means of spring loaded insert type guides. The carbide backup with double ball bearings are built for heavy-duty life.

NEW JOB SELECTOR—a famous DoALL feature, now adapted for cut-off work. Guesswork eliminated for over 200 frequently used materials. Indicates correct speed, band type, coolant and anticipated sawing rate.

NEW SPEED INDICATOR—electronic tachometer permits more accurate setting and continuous monitoring of blade speed.

NEW FEED INDICATOR—suppressed type gage amplifies needle swing within sawing range for easier feed control and accurate repeat settings.

NEW WORK HEIGHT SELECTOR—(optional) eliminates wasted cutting head over-travel. Simply set control to size and head automatically rises just enough to clear workpiece. Dial control eliminates operator adjustments.

These and many other functional features are incorporated in the completely new, fully automatic Model C-68 and manual Model C-67 Power Saws.

PS-13

Demon® SAW BLADES

CUT SAWING COSTS . . . SAVE MATERIAL

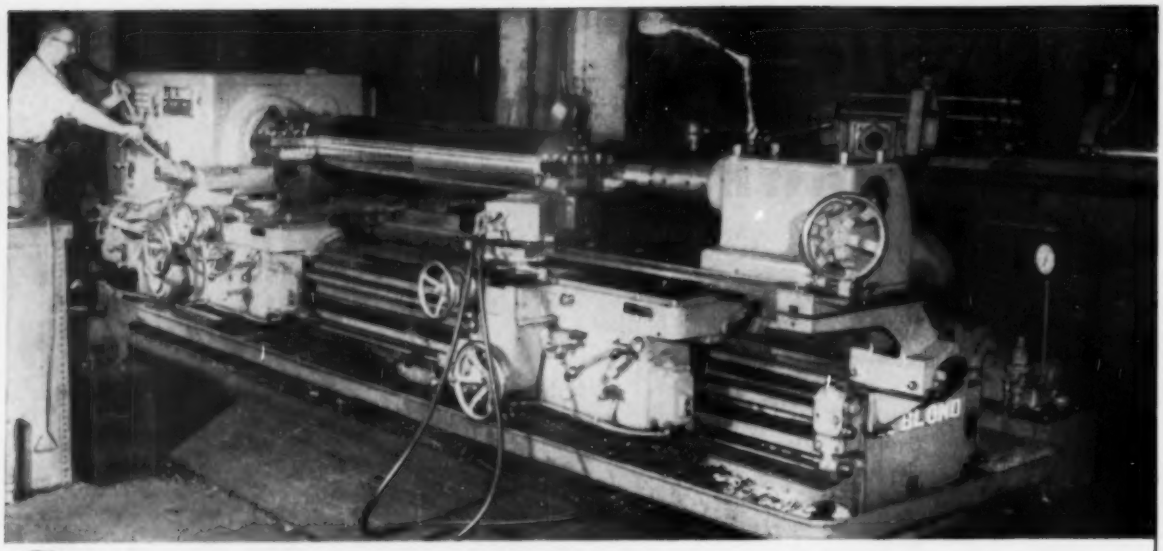
The new C-67 and C-68 Power Saws are designed for maximum production and blade life using Demon High-Speed Steel Saw Bands. These bands cut up to ten times faster and last 30 times longer than carbon steel. And being only 1/16" thick, kerf material waste is minimized on each and every cut.

Free Power Saw Demonstration

Call your local DoALL store for a free "in-your-plant" demonstration —on your own materials and cut-off problems. Get your copy of the new Power Saw Bulletin describing the new DoALL C-67 and C-68 Power Saws.

THIS IS A TYPICAL DoALL STORE

The DoALL Company, Des Plaines, Illinois



"We refuse to sacrifice half our machine capacity to save pennies on tool costs"

. . . so says a Tool Engineer of a progressive company that increased speeds and feeds on a new 50-hp heavy-duty LeBlond tracer lathe to reduce tool life from 75 to 25 minutes. He challenged the economics of the long-tool life theory. Now, two edges of a Kennametal* "throw-away" insert are used to machine a cylinder 72" long by 15½" diameter. But, he reports: "Two 21¢ cutting edges are an extremely small price to get high efficiency from a fine big machine."

Equipped with a Kendex* (Pattented) KSBR-86 style tool holder with "throw-away" inserts, the lathe is turning 1040 steel with a 325 Brinell hardness. Now operating the lathe at 111 rpm, 430 sfpm, .027 feed, the company is satisfied that the increased tool cost, from 18¢ to 62¢ per hour, is insignificant because they have *tripled the output of a machine charged at $10 per hour.*

Ask your Kennametal Carbide Engineer how other companies are relieving the squeeze on profits by sacrificing pennies in tool life for top machine output. Ask him how your shop may get more work out of present machines at less cost. Or write KENNAMETAL INC., Latrobe, Pa., for the full story . . . ask for the booklet, "There's Profit in Retiring a Tradition."

*Trademark

CHECK THE SAVINGS POSSIBILITIES IN YOUR OPERATIONS

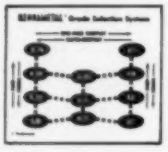
Jot down costs of throw-away inserts and output of one of your present machines . . . then in the next column the same data when insert life is reduced to 20, 30 or 40 minutes. The cost of inserts will multiply . . . but look what happens to over-all cost-per-piece and profit!

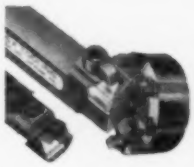
	Setup to get longest possible tool life	Full-capacity setup (for highest machine efficiency and output)
Machine cost per hour		
Tool cost per hour		
Total per 8-hour shift		
Pieces run per shift		
COST PER PIECE		

TO MULTIPLY YOUR MACHINE OUTPUT ...YOU NEED THREE THINGS:

1. The "Three-Man Tooling Team" that utilizes the specialized knowledge of your Tool Engineer, your Machine Operator, and the Kennametal Carbide Engineer . . . *to determine the right tooling.*

2. The Kennametal complete range of Grades that provides the precise properties and uniformity that *permits accurate prediction of tool life.*





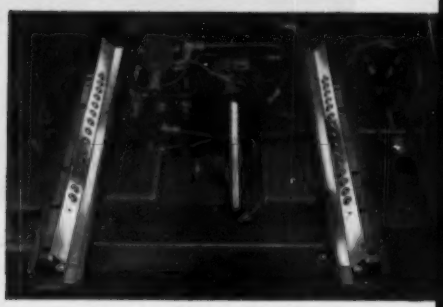
3. Kendex* (patented) instant insert change without need to reposition the tool. This is the key to this new practice . . . *frequent tool change without excessive downtime.*

8760

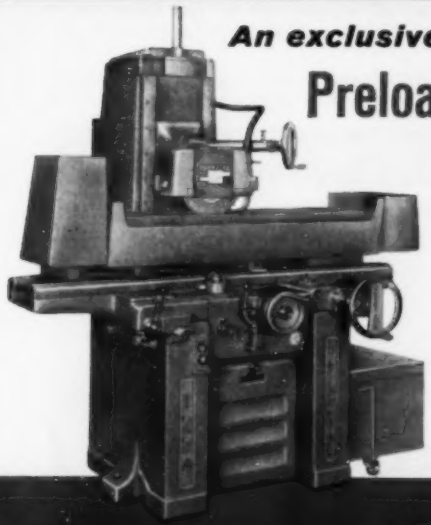
Don't waste $$$ in machine output to save ¢¢¢ in longer tool life

INDUSTRY AND **KENNAMETAL**

. . . Partners in Progress



Underside of saddle shows ¾" ball bearings, hardened and ground steel ways and precision ground feed screw.



An exclusive Hydrabrasive surface grinder feature . . .

Preloaded ball ways for more sensitive saddle movement and longer life

This feature, which is standard equipment on Landis Hydrabrasives, gives you more accuracy at no extra cost. It will help your operators get the most from their skills and give you highest precision on piece after piece.

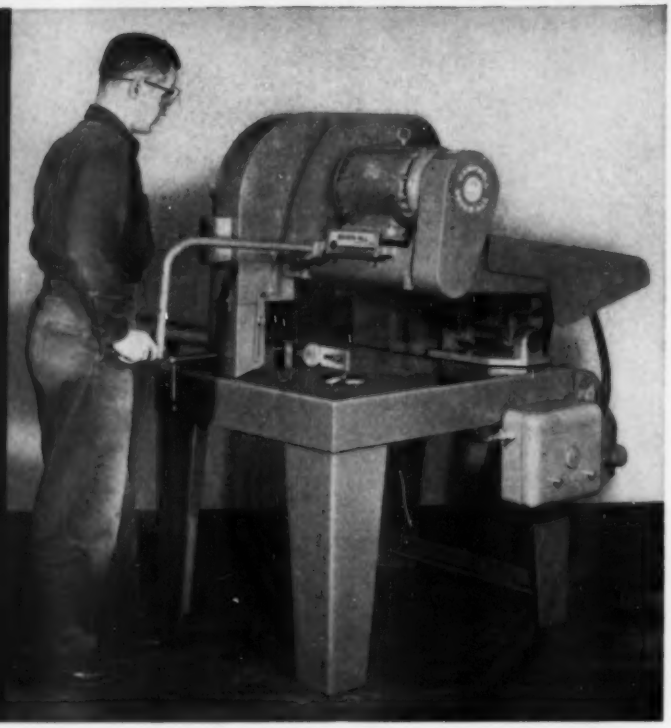
Landis Hydrabrasive Surface Grinders are made in 4 sizes: 8" x 24", 12" x 18", 12" x 24" and 12" x 30". The standard 12" grinding wheel is driven by a 3 hp motor. Larger wheels and motors are available.

ABRASIVE
precision surface grinders

a product of
LANDIS TOOL
world's largest manufacturer of precision grinding machinery
WAYNESBORO, PENNSYLVANIA

NEW!

GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

Big capacity • cuts 4" round or square solids, 5½" O.D. pipe or tubing, 6"x1" flat stock, 6" angle iron and 8" channels. Cuts practically all metals.

Fast operation • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4" bar of hardened steel in 45 seconds, or a 2" pipe in 3 seconds.

Power oscillation • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

Quality cuts • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

Economy • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

Safe • wheel guard provides complete operator protection.

Minimum maintenance • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

Built to last • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

***Write for details** on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299*

SEVER-ALL ABRASIVE CUTTING MACHINES

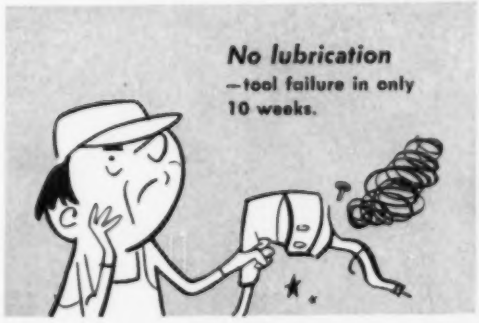
Allison-Campbell Division, American Chain & Cable Company, Inc.

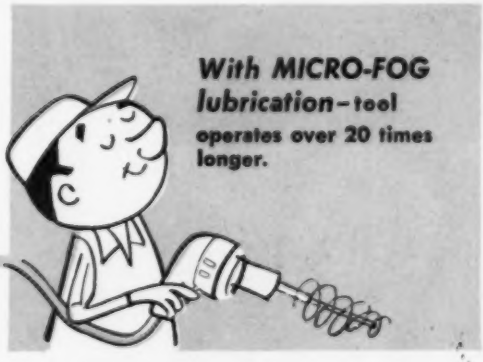
923 Connecticut Avenue, Bridgeport 2, Conn.

ACCO

Tests prove Air tools operate over 20 times longer

Lubricated with Norgren MICRO-FOG!





Test Conditions: Air operated screw drivers were tested under identical, carefully controlled simulated working conditions. In one test, no lubrication was provided. In the second, Norgren MICRO-FOG Lubrication was injected into the compressed air system powering the tool.

Results: *Without lubrication,* maintenance was required after only 71,400 cycles (equivalent to 7 weeks normal operation). Rotor blades were then reversed. Complete failure occurred after 101,400 cycles (10 weeks normal operation).

With MICRO-FOG Lubrication, even after 2,101,400 cycles (equivalent to 4.2 years normal operation) inspection showed only slight wear.

This means a big savings for you in air tool replacement costs...your tools operate over *20 times longer* lubricated with Norgren MICRO-FOG.

For complete information, call your nearby Norgren Representative listed in your telephone directory—or WRITE FOR DESCRIPTIVE LITERATURE.

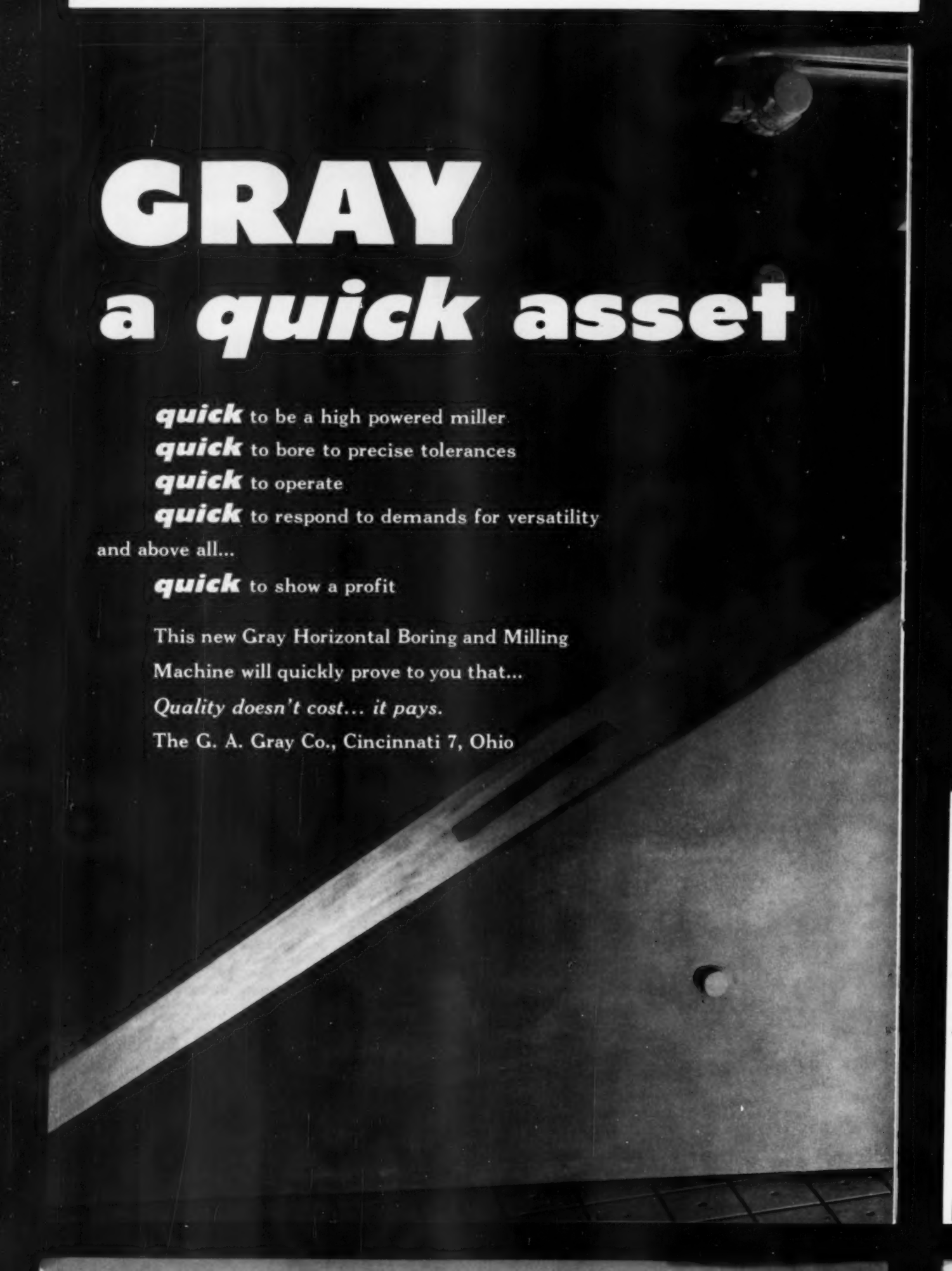
If it's Norgren...It's Dependable.

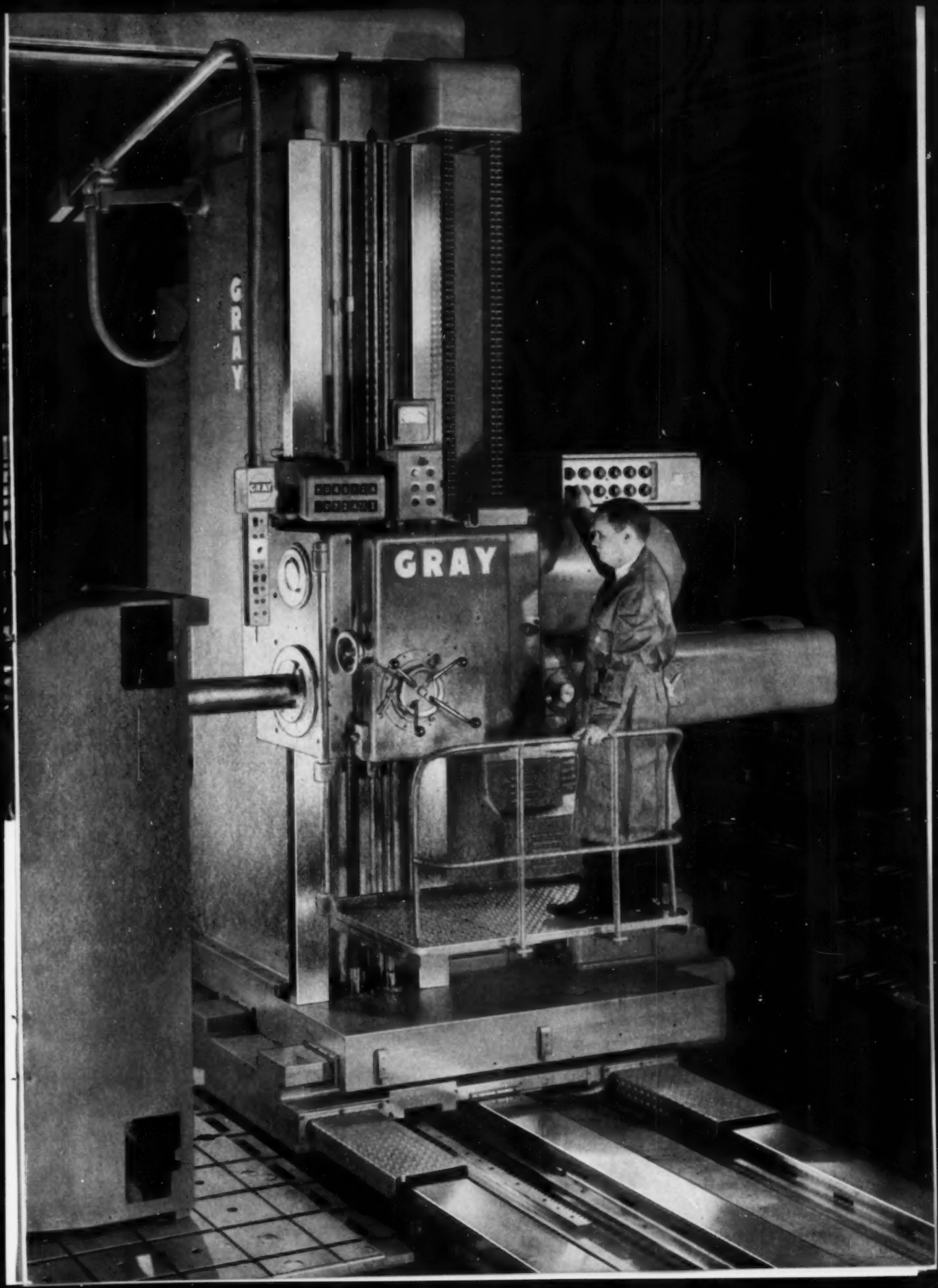
C. A. NORGREN CO.

3436 SO. ELATI STREET • ENGLEWOOD, COLORADO

CIRCLE 176 READER SERVICE CARD

CIRCLE 177 READER SERVICE CARD ►


GRAY
a quick asset
quick to be a high powered miller
quick to bore to precise tolerances
quick to operate
quick to respond to demands for versatility
and above all...
quick to show a profit
This new Gray Horizontal Boring and Milling
Machine will quickly prove to you that...
Quality doesn't cost... it pays.
The G. A. Gray Co., Cincinnati 7, Ohio


GRAY
GRAY
GRAY

35% Faster with a BULLARD CUT MASTER Model 75

With their new 76" Bullard Cut Master, Model 75, the Bird Machine Company, South Walpole, Mass., is machining a 39-5/8" diameter stainless steel cylinder frame assembly 35% faster than previously, according to Mr. James Lindsay, General Superintendent.

For the rough cut, removing from 1/8" to 3/16" of stock, the ram and side heads are cutting simultaneously. On the finish cut, .005" deep, only the side head is used.

Accuracy to hold size reduces spoilage. Pendant control reduces operator fatigue. These factors contribute to make these savings possible.

An analysis of your turning, boring, facing and threading operations may show a savings over your present method. Your Bullard Sales Engineer can tell you. Why not ask him?

Or, write

THE BULLARD COMPANY
BRIDGEPORT 9, CONNECTICUT

Big Hit for Decca --DARINA

Decca Records, Pinckneyville, Illinois uses Shell Darina Grease 2 for the entire plant's grease lubrication.

When Decca Records opened its Pinckneyville plant late in 1957, it required a high-temperature grease for the hot plasticizing mills. After testing many greases under actual plant conditions, Shell Darina Grease 2 was selected. In fact, Darina® proved so successful in its original application that Decca now uses it throughout the plant.

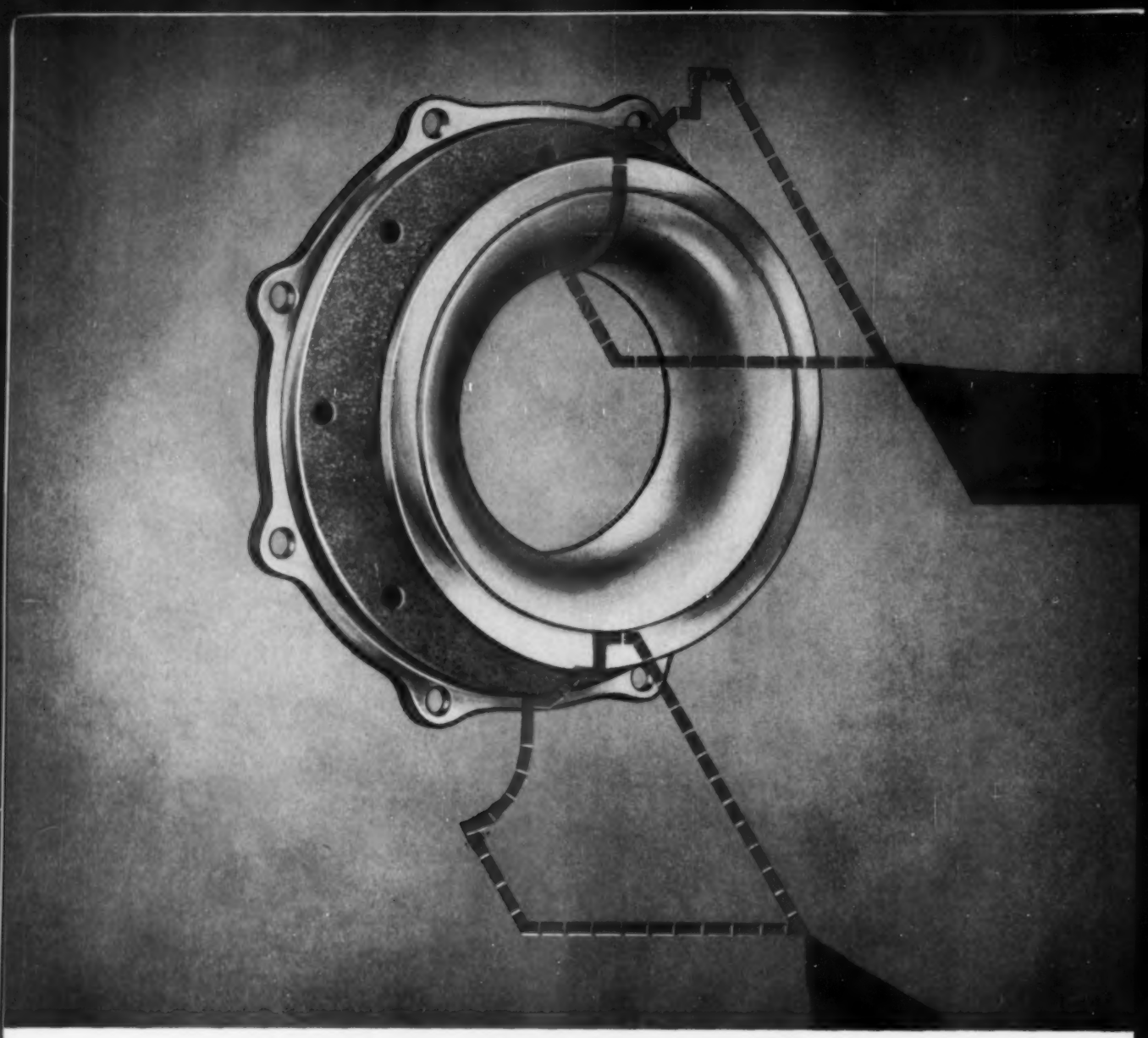
Darina Grease 2 is a premium-quality, multi-purpose grease with exceptional stability in extended high-temperature applications. It offers excellent resistance to corrosion and oxidation. It gives outstanding performance (compared with conventional soap-type greases) for long-time wet or dry applications at temperatures as high as 350° F.

For complete data on Darina Grease, write Shell Oil Company, 50 West 50th Street, New York 20, New York, or 100 Bush Street, San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.

SHELL DARINA GREASE

the multi-purpose, high-temperature grease

SHELL

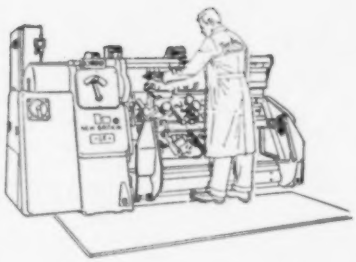


seven *surfaces to turn:* **one** *template,* **one** *slide,* **two** *tools.*

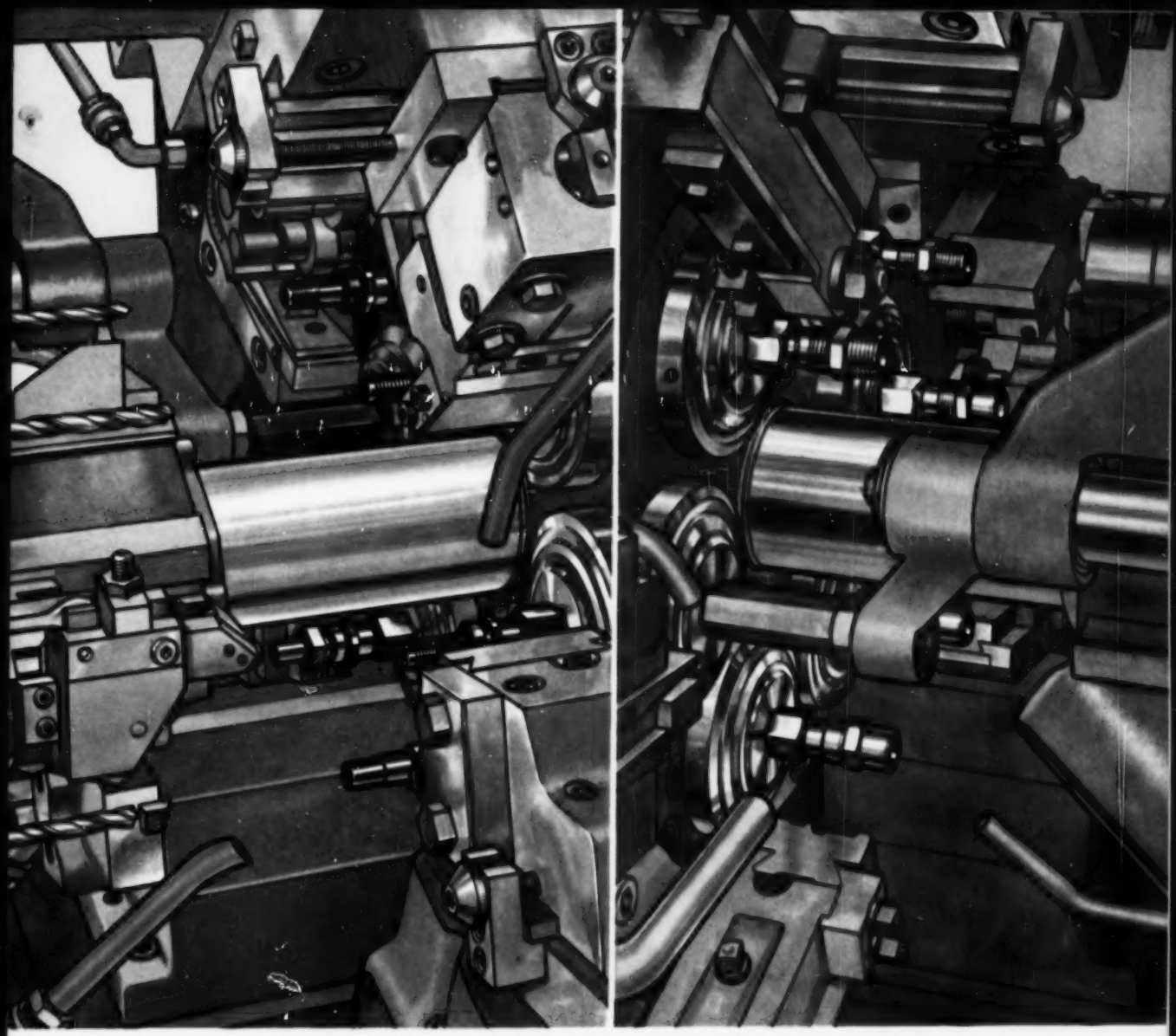
Machine tools are rarely if ever bought because somebody thinks they might come in handy. They are bought because a specific job needs to be done and because a particular machine is judged best fitted to do it. However, no matter how specific your need may be, *versatility* is the greatest by-product you can buy, and the greatest assurance of a profitable investment.

Perhaps your problem is economical, long-run production of a contoured shaft piece. Well and good: your best bet is a New Britain +GF+ copying lathe. Now let's suppose you develop a requirement for only a few hundred pieces like the one illustrated. Your New Britain +GF+ is every bit as efficient. Simple tooling; fast setup; rapid, accurate production.

The applications for contour turning are very broad. If you have contour turning, boring and facing work on shafts or chucking work, you should be interested in the New Britain +GF+. Many shops whose production requirements wouldn't justify very expensive, lightning-fast production can make highly profitable use of one of the basic models because of its versatility, accuracy, fast setup and inexpensive tooling. At the other end of the scale,



you can't touch our machines for tremendous volume work. Obviously, this subject is much too broad and too important to do justice to it here. We would like to send you literature that spells things out in much more detail. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

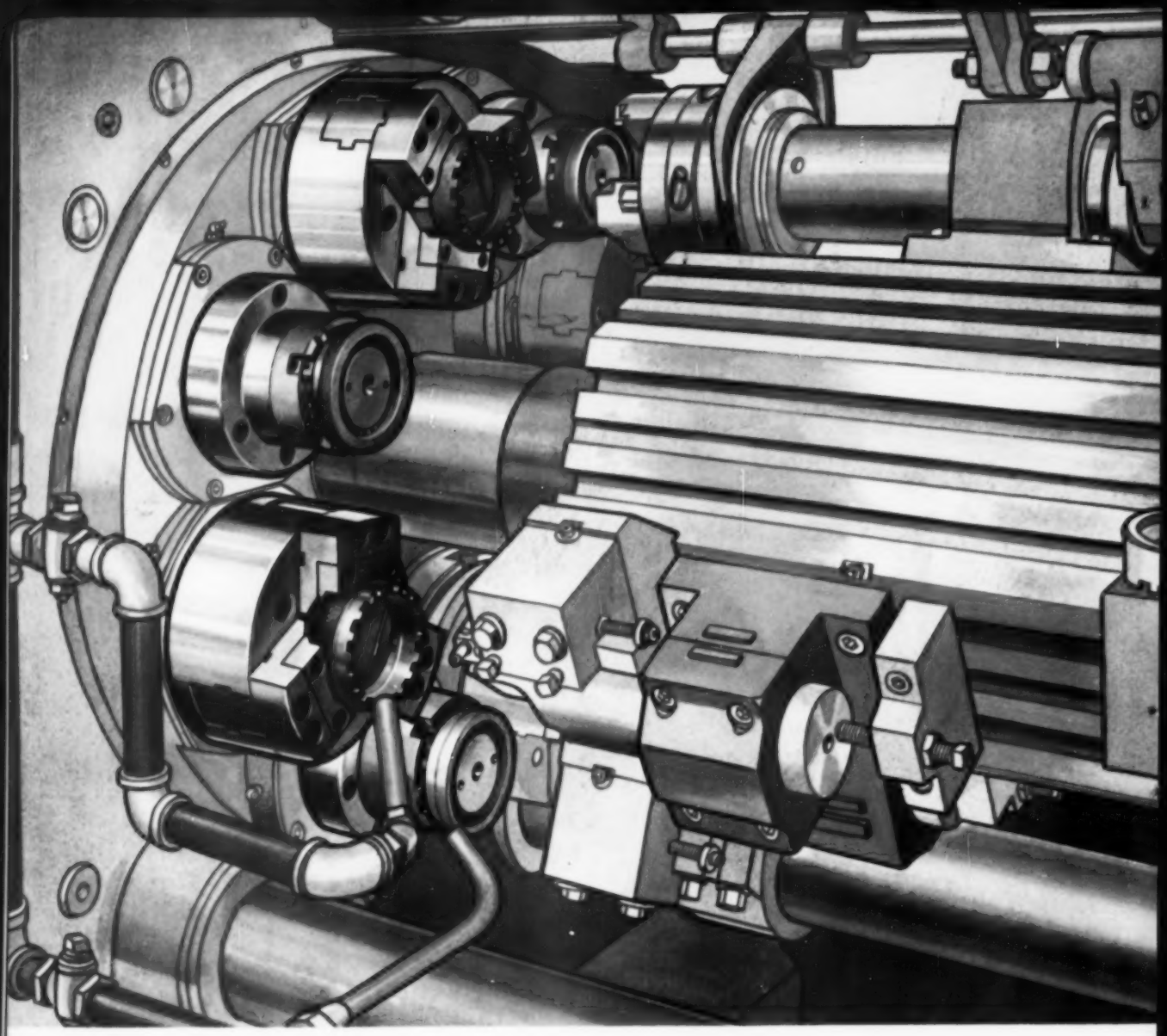


stainless, **225** *per hour—brass* **1500** *per hour.*

Up to a point increased machine productivity is a matter of refinements, additions, skillful tooling and perhaps more power. Eventually you achieve about all the efficiency that can be built into equipment of conventional design.

To achieve a major break-through in bar machine productivity necessitated redesign from the ground up. New Britain has done it with such success that we are able to offer the metalworking industry a whole new family of machines with performance unequalled anywhere. Independently cammed cross slides open up a whole new world of tooling possibilities. Power and spindle speeds are adapted to the important new metals and alloys. Increased chucking capacity allows application of New Britain standards of speed and accuracy to much larger pieces. None of the famous New Britain exclusive features which preserve accuracy and increase accessibility over other machines have been sacrificed. The chart below tells part of the story, and we have complete literature available to spell it out completely on the models which interest you particularly. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

Model	Spindles	Cross Slides	Spindle Speeds	Spindle Capacity	H.P.	Weight
45	4	4	43-526	5″	30-50	46,000
52	6	6	271-4250	1 1/4″	15-25	12,800
62	6	6	177-3000	1 5/8″	15-30	18,800
62	6	6	177-3000	2 1/4″	20-30	18,875
82	6	6	64-633	3 1/2″	30-50	46,000
83	8	6	99-1504	2 5/8″	30-50	46,000



open secret *of New Britain superiority.*

Wide-open design makes the most fundamental difference between a New Britain automatic chucking machine and other machines. It speaks for itself as a means of getting at the tooling, making adjustments and clearing chips.

Massiveness, right from the floor up, is equally apparent and equally important in chucker work. You see it in the way the cutting tools make the heaviest cuts with a chatter-free smoothness that can't be duplicated.

Only New Britain provides a combination of longitudinal with transverse forming motion where needed. This versatility eliminates the need for second operation machines in many cases —particularly when a job is setup for double indexing, as illustrated above.

New Britain spares no pains to incorporate every new development to make chucker-type machining more profitable. The open-end design lends itself particularly well to magazine loading and unloading, for example, and many New Britains are being equipped to provide this feature.

Whenever a number of operations are required on cast or forged pieces, these massive, rugged, powerful machines offer great possibilities for savings through faster, more accurate, more reliable production. A new and complete catalog on the New Britain chucker line is just off the press. We would be very glad to send you your copy. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

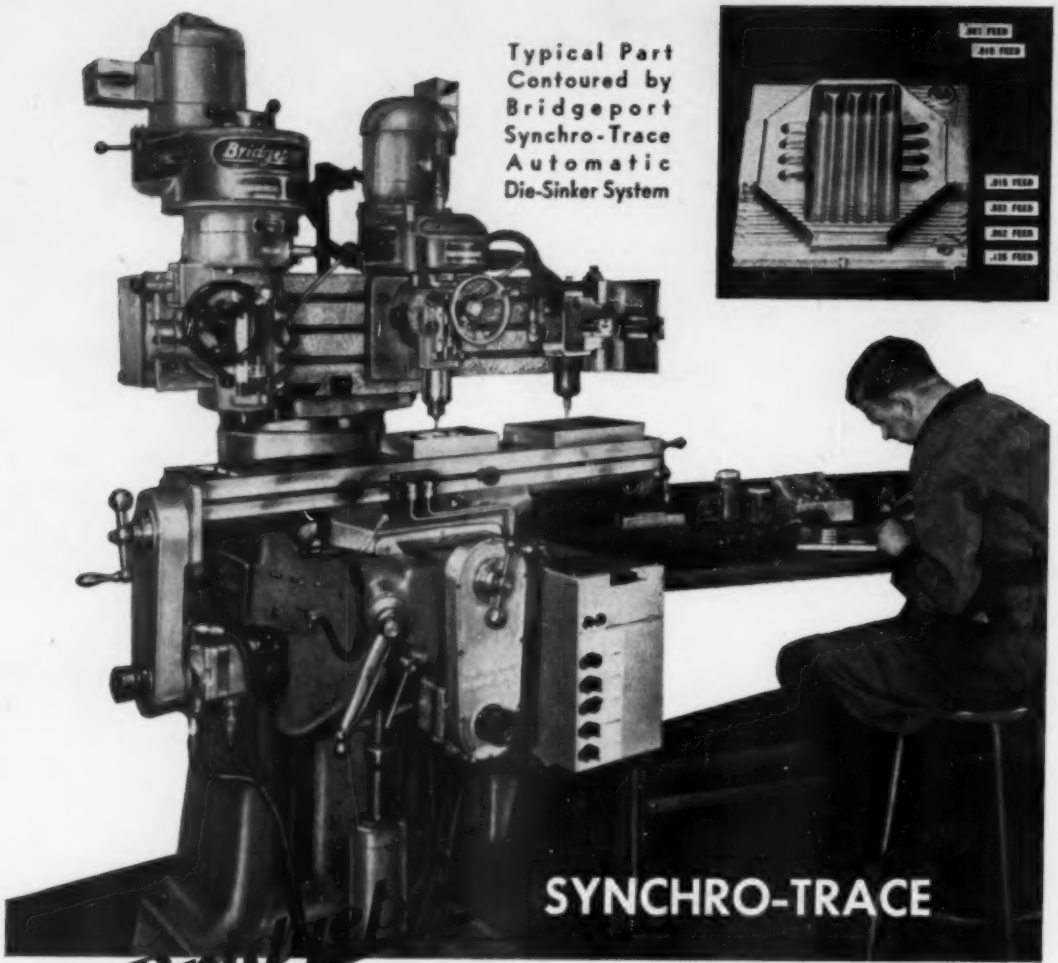
Announcement

New Britain's new and completely modern Rebuild-Retool Center at Bridgeport, Michigan, is important to every present and prospective owner of New Britain Automatics.

This is the first center established exclusively for the rebuilding and retooling of production machinery. It is staffed by men trained specifically for this type of work. It is equipped specially for putting New Britains back on the job with maximum efficiency in minimum time, at minimum expense to the owner.

Rebuilding and retooling may be "orphan jobs" elsewhere, but they rate top treatment at New Britain. Here is an important extra reason for selecting a New Britain when you purchase new equipment—a full time specialist organization devoted to protection of your investment.

If you would like to investigate the profit potential in a complete modernizing program, or could profit from a factory-engineered retooling of one or more machines, write us either at New Britain, Connecticut, or Bridgeport, Michigan. The New Britain Machine Company.



Bridgeport produces accurately-controlled duplicated parts in far less time

In many cases parts are duplicated in 50% less time . . . at vastly less cost. Other advantages and features of the BRIDGEPORT Synchro-Trace include:

Since Synchro-Trace is similar to numerical control in that it follows a programmed cutting path and takes a pre-determined cut with every pass of the cutter, an accurate estimate of machining time required for die or part may be made. Estimating accuracy is further simplified since the BRIDGEPORT Synchro-Trace operates continuously, without stopping, until part is complete.

. . . any type finish available by simple adjustment of pick feed.

. . . built-in power feeds on cross and longitudinal movements with variable feed rate.

. . . BRIDGEPORT Synchro-Trace provides push button rapid traverse.

. . . ability to use as a standard hand-fed machine.

. . . conventional 180° die-sinking available for roughing.

. . . uniform cutting feed in any plane, vertical or horizontal, saving tool costs and assuring greater accuracy because cutter neither overcuts nor undercuts on vertical walls. Uniform load on cutter extends tool life.

. . . ability to pick in either direction eliminates many hours of benching time. Hand or other finishing operations reduced to an absolute minimum, with costs reduced accordingly.

. . . all machining functions automatically stop when automatic shut-down knob is engaged and cutter has finished its last scanning pass.

Get further details by contacting your nearest dealer or us direct.

Bridgeport MACHINES, INC.

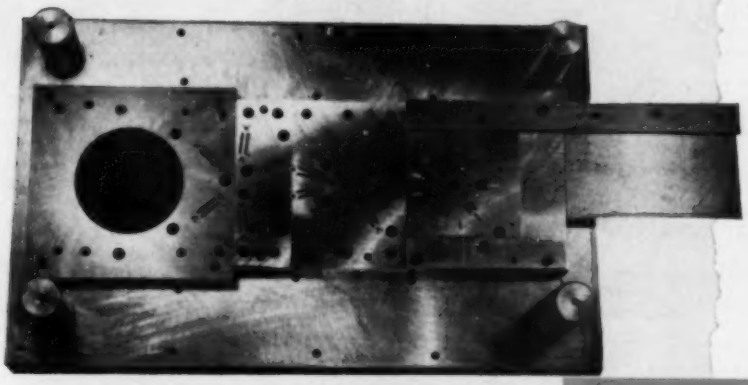
Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

YOU CAN APPLY *POLARIZED*

RUST VETO 377

EVEN ON WET METAL... TO PREVENT RUST



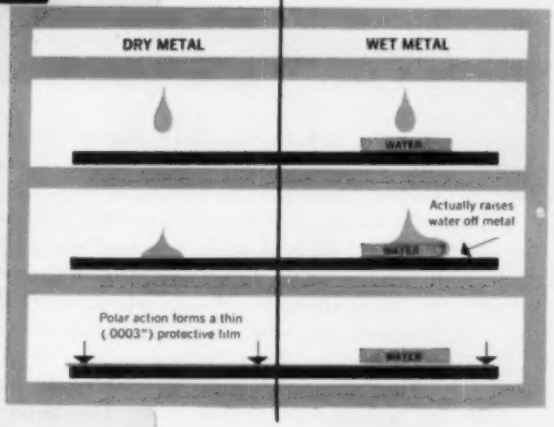
Tools, dies and other precision finished parts coming off machines that use water-soluble coolants, no longer have to be dried before applying a rust preventive.

Rust Veto 377's tough, thin film also does not have to be removed before parts are used or further processed, unless painting or plating is to be done. The film is almost invisible, yet it resists oxidation for as long as a year without deteriorating.

For full details about Rust Veto 377 send for NEW ILLUSTRATED BULLETIN or for help on any industrial rust prevention problem, call or write: E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

When preserving for military use specify **COSMOLINE 377** (Conforms to MIL-C-14201A, Grade 2)

Multi-purpose indoor rust preventive **actually raises water off metal** to form a long-lasting protective film under the moisture.



COSMOLINE / RUST VETO

Most famous names in rust prevention

products of . . .

E. F. HOUGHTON & CO.

Ready to give you on-the-job service

Philadelphia, Pa. • Chicago, Ill. • Carrollton, Ga. • Detroit, Mich. • San Francisco, Calif. • Toronto, Canada

POP'S school of Filing

HERE'S THE BEST TRICK YET...THE NICHOLSON "MAGICUT" FILE
THE NEW BOY EXPECTED POP TO PULL RABBITS OUT OF THE HAT
THE "MAGICUT" FILE IS EVEN BETTER... WORKS MAGIC ON METALS

There's a Nicholson or Black Diamond file for every purpose . . . 6000 of them in fact. There's one that's ideal for your metal removing job.

For example, the Nicholson or Black Diamond "Magicut" file is an all-purpose machinist's type. It removes up to 25% more metal with every stroke. This means that by changing to the "Magicut" file, you can reduce filing costs as much as 25%.

The "Magicut's" extra efficiency comes from the unique structure of the teeth. They're on an extreme angle and called "penetrating-planer" type teeth. With each stroke they take a deep bite *and leave a smooth surface.*

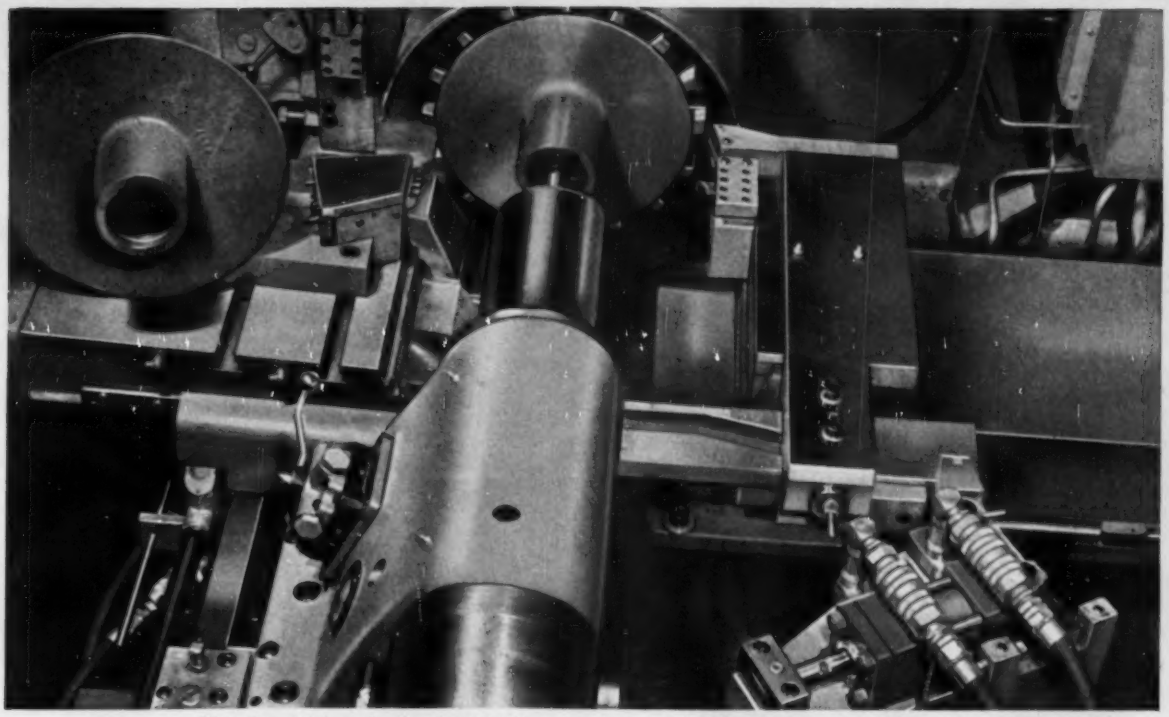
You can use the "Magicut" file on all soft or machine temper metals. Ask your Nicholson or Black Diamond file distributor to demonstrate this file. Try it yourself. You'll get faster filing results at lower cost. And remember . . . it isn't a "Magicut" file unless it carries the Nicholson or Black Diamond trademark . . . your assurance of outstanding performance.

✻ ***Industrial Distributors provide the finest goods and services in the least possible time. Our products are sold exclusively through them.***

NICHOLSON

Nicholson File Company, Providence 1, Rhode Island

FILES • ROTARY BURS • HACKSAW AND BAND SAW BLADES
GROUND FLAT STOCK • INDUSTRIAL HAMMERS



Note how 16-jaw chuck grips 10"-diameter, inner pulley disc on narrow portion of O.D. This permits machining entire flange face. Accurate taper is generated by cam-operated sliding toolholder shown at right.

No. 12 replaces two manual lathes, cuts time 53%

Automatic cycle, fast setup cut job-lot costs...free operator for other work.

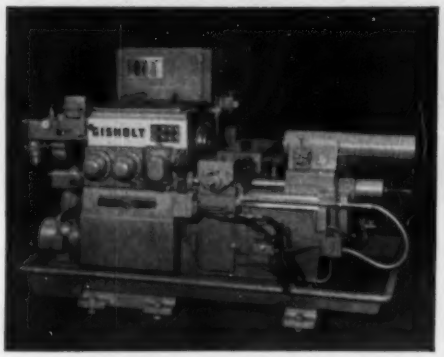
This fast, versatile setup may give you some new ideas on paring job-lot costs. Lewellen Manufacturing Company, Columbus, Indiana, uses it for machining three types of cast iron pulley discs in 15 sizes—in lots ranging from 50 to 100 pieces.

Previously this work required two manually operated lathes. Now one operator does the entire job 53% faster on one Gisholt No. 12 MASTERLINE Automatic Chucking Lathe.

Here's how a typical inner pulley disc, 10" in diameter, is handled: To permit machining beyond the tapered face, the work is held on a narrow portion of the previously turned O.D. in a 16-jaw chuck. A chuck-mounted mandrel with tailstock support provides rigidity for higher speeds and feeds.

Front carriage tools turn the hub O.D. within .0005" and form the base radius. The flange is taper-faced from a cam-controlled sliding toolholder on the rear independent slide. A second tool faces the hub end. Time, just 2.2 minutes, f.t.f.

Change-over for different sizes averages less than 30 minutes. One 30° adjustable cam handles all tapers. Quick-disconnect fittings are easily reversed for tool relief when changing from inner to outer discs.



Gisholt MASTERLINE No. 12 Automatic Chucking Lathe

FOR COMPLETE INFORMATION

on how the No. 12 can cut your costs on job-lots and production runs, contact your Gisholt Representative—or write for new catalog, Form 1213.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes • *Factory-Rebuilt Machines with New-Machine Guarantee.*

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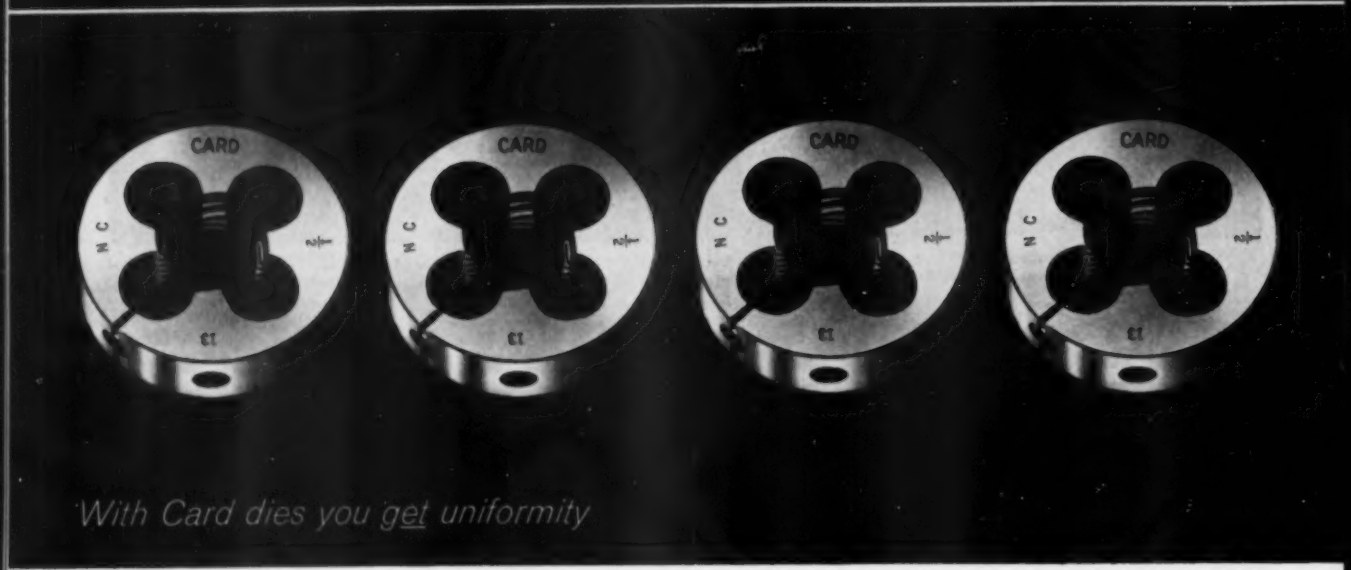
When you see uniformity, remember . . .



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. . . And every one is backed by Card Division's *process inspection.* This thorough inspection system starts with the bar stock and is carried through each succeeding step of production . . . machining . . . heat treating . . . finishing. Every dimension is critically checked by men and machines. You get dies that are uniform . . . tools that you can depend on to do their jobs efficiently . . . economically. Your Card technical man has full details on how the high precision of Card dies can improve *your* production picture. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

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The more you use cutters the more you need Union

In addition to Union's full line of standard milling cutters, Union is prepared to lay out and design cutters singly or in gangs, for all your milling operations. In addition, Union technical men are showing plants throughout the country how production time and costs can be cut with solid milling and gear cutters, inserted blade cutters, drills, end mills, reamers, hobs and carbide tools. **Available nationally through Union Distributors** and stocked in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

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Which of these SKF bearings fits the needs of your design?

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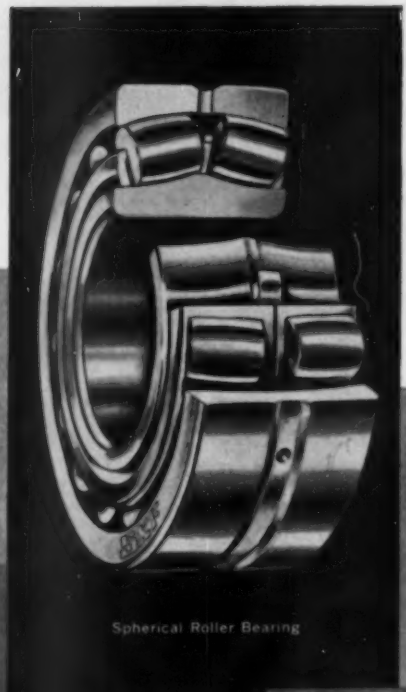
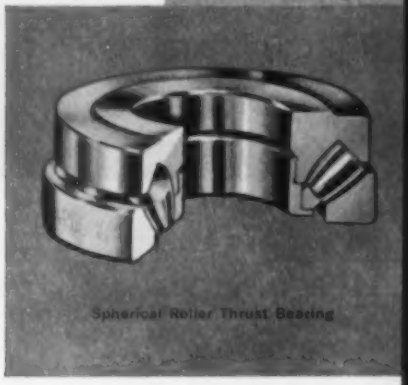
Take the spherical roller bearing, for example. Recently re-designed, it now offers 25 to 50% increased capacity and 2 to 3½ times longer service life. Yet it's a standard SKF bearing—promptly available in over 130 standard sizes ranging from 2.4" to 53.5" O.D., with every possible combination of seals, shields and adaptors to meet your specifications.

But why not get full details on this—or any other— SKF bearing? Each is made to do an efficient, economical job for you. Call any one of the 25 SKF sales offices today. 5906

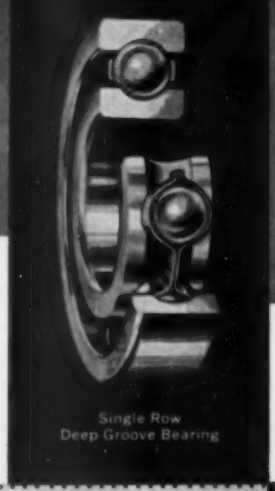
Cylindrical Roller Bearing


Spherical Roller Bearing

Angular Contact Bearing


Spherical Roller Thrust Bearing

Tyson Tapered Roller Bearing


Single Row Deep Groove Bearing

Spherical, Cylindrical, Ball, and Tyson *Tapered Roller Bearings*

EVERY TYPE · EVERY USE

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Salt River Valley Water Users Association,
Phoenix, Arizona

Saves $699.00 per pump...

by using ground and polished

fatigue-proof STEEL BARS **e.t.d.**

made by elevated temperature drawing process

FATIGUE-PROOF permits smaller shaft here
FATIGUE-PROOF permits smaller bearing here
FATIGUE-PROOF permits smaller shaft housing here
FATIGUE-PROOF permits smaller shaft coupling here

The men who operate the "Salt River" project have the job of supplying water to 240,000 acres of land in Arizona, where the Gila River joins the Salt River. The Association maintains some 250 deep well pumps to help supply the required water.

Richard Juetten, Supervisor of Salt River's Pump Division, reports that the use of La Salle FATIGUE-PROOF steel bars has permitted a saving of $699.00 per pump . . . a potential saving of $174,750 when applied to the 250 pumps now in operation.

Mr. Juetten's report follows:

"I have figured our direct saving realized by using La Salle FATIGUE-PROOF steel bars in place of standard C-1045 steel shaft in our deep well turbine pumps.

"FATIGUE-PROOF enables us to use bars only 1 11/16" in diameter . . . instead of 2 3/16" diameter shafts which were necessary when we used C-1045 . . . and this despite higher horsepower, more weight, and additional pump bowl assemblies.

"Here are comparative costs per 10-foot section (of a 300-foot pump shaft):"

using C-1045		using FATIGUE-PROOF	
10' x 2-3/16" dia. shaft	$28.30	10' x 1-11/16" dia. FATIGUE-PROOF	$22.59
3½" shaft housing	26.30	3" shaft housing	19.80
2 bearings, 3½" x 2-3/16"	21.72	2 bearings, 3" x 1-11/16"	13.46
Shaft coupling	5.16	Shaft coupling	2.34
TOTAL cost	$81.48	TOTAL cost	$58.19
Cost per foot	$ 8.15	Cost per foot reduced to	$ 5.82

RESULT: A saving of $2.33 per foot . . . or $699.00 when applied to a 300-foot pump setting. And this doesn't take into consideration reduced power consumption.

La Salle STEEL CO.

1416 150th Street
Hammond, Indiana

ASK FOR 24-PAGE BOOKLET—It tells the complete story of FATIGUE-PROOF®

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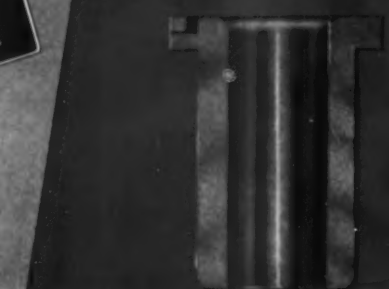
Write for free catalog describing Standard Drill Bushings, Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, Kwik-Switch Tool Holders, Mikro-Lok Boring Bars, Index Plungers and other Universal Products.



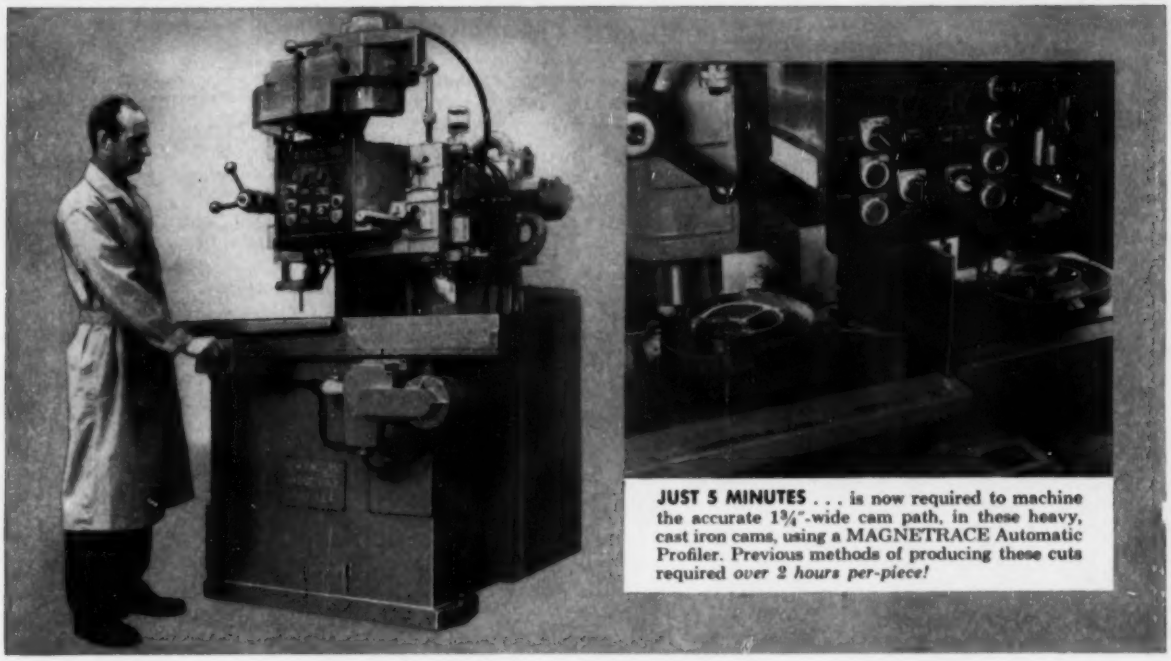
The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size. Request your calculator—free—on your company letterhead.

208

UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 1, MICHIGAN

ACCURACY ASSURED...

...and complex contours produced at PLAIN-MILLING SPEEDS and FEEDS with



JUST 5 MINUTES . . . is now required to machine the accurate 1¾"-wide cam path, in these heavy, cast iron cams, using a MAGNETRACE Automatic Profiler. Previous methods of producing these cuts required *over 2 hours per-piece!*

the All-New MagneTRACE Automatic Profiler

TRADE MARK

Designed, developed and built from the base up *specifically* for 360° profile milling under tracer control, the MAGNETRACE is compact, rigidly constructed, and has a powerful 7-speed spindle drive for fast removal of heavy metal. This powerful drive – plus the fact that the tracer follows the easily prepared steel template at a constant, preset feed up to 80 inches-per-minute – makes it possible to mill complex, irregular contours as fast as conventional machines produce plain-milling cuts. Many jobs ordinarily requiring roughing and finishing cuts are completed in a single pass. Finer finishes are obtained, and cutter life is greatly increased!

In addition, the extreme sensitivity of the unique MAGNETRACE tracer system (which requires a stylus deflection of only .0002" to activate the drive units), the complete elimination of backlash in the slide motions, and the overall precision and rigidity make it possible for the MAGNETRACE to produce copy milling with an accuracy comparable to that of precision, plain milling operations.

FOR COMPLETE INFORMATION

. . . write now for your free copy of the new P&W 8-page Circular No. 635. See how the greatly increased speed and accuracy of the MAGNETRACE can be translated into actual dollars-and-cents savings in your shop. Pratt & Whitney Company, Incorporated, 11 Charter Oak Blvd., West Hartford, Conn.

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Direct Costs: these include direct dollar savings as realized by Minneapolis Honeywell . . . an "every day" job for Acme-Gridleys.

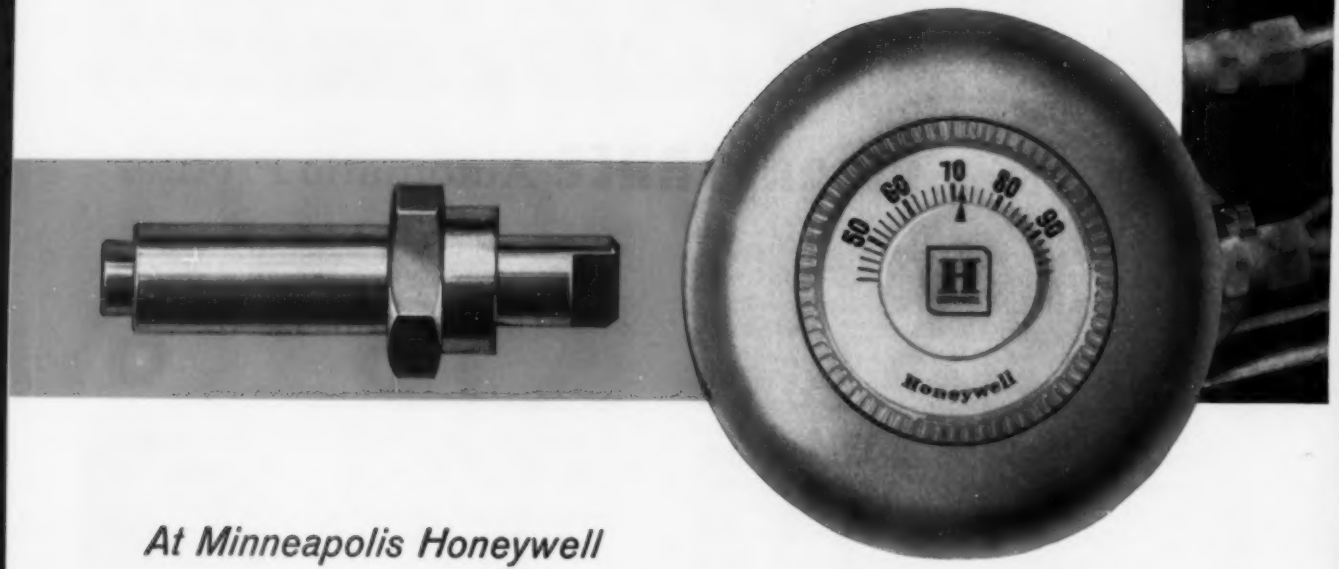
Indirect Costs: effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc.

Product Redesign: teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities.

Direct Material Costs: our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems.

Make-or-Buy Reviews: in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment.

Spot Modernization: pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.



At Minneapolis Honeywell

ONE ACME-GRIDLEY REPLACES FIVE SINGLE SPINDLE MACHINES

. . . Saves 200% in Machine Hours

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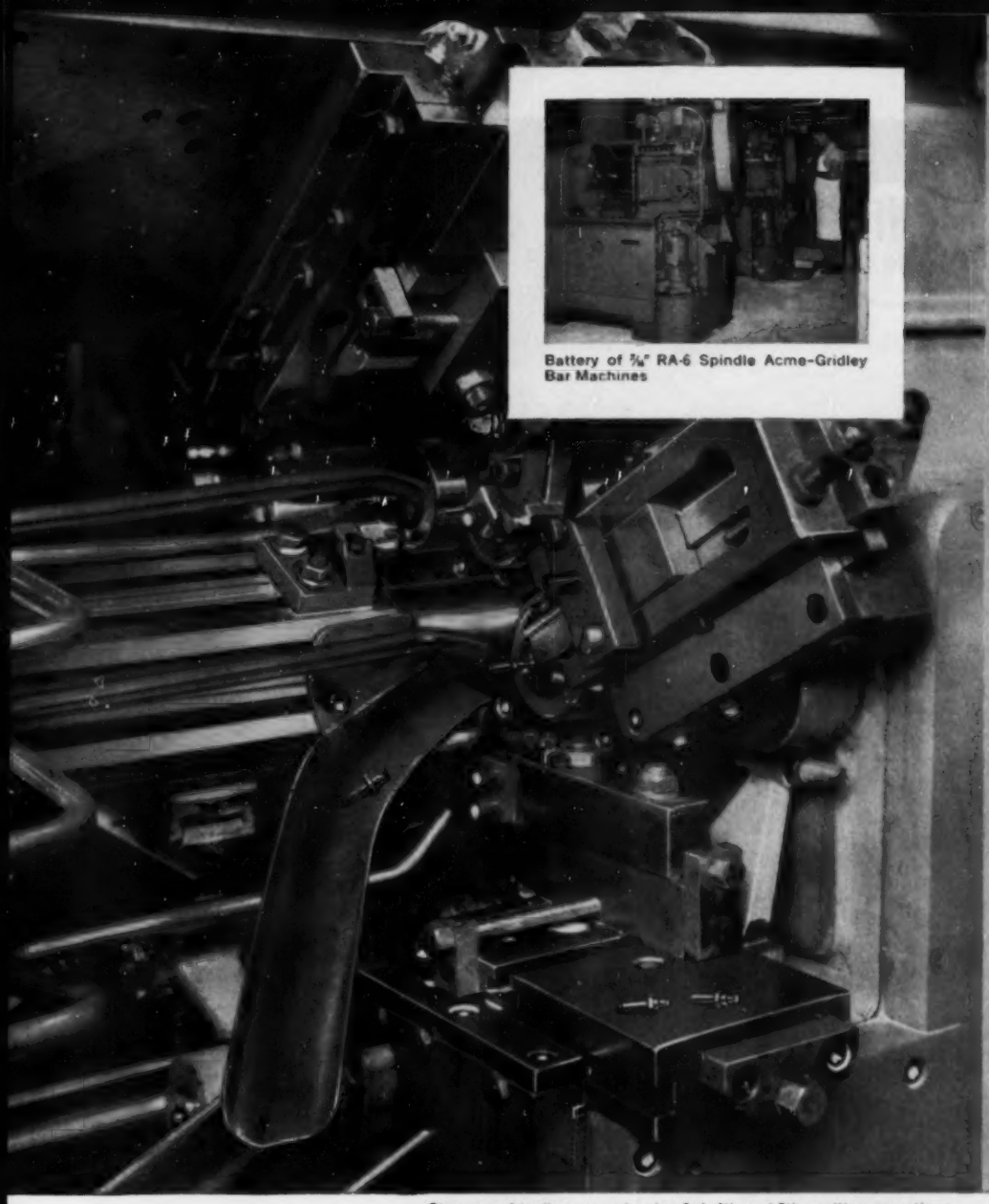
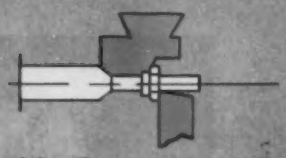
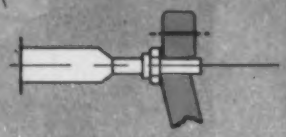


Battery of ⅞" RA-6 Spindle Acme-Gridley Bar Machines

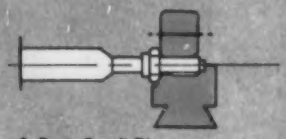
7 Operations in 2.75 Seconds



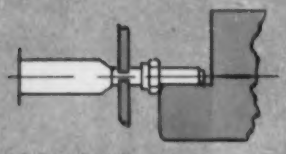
6. Form Rear—Rough Turn—Front Dia.



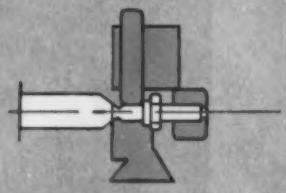
1. Finish Turn Front Dia.



2. Form Small Dia. and Face End—Support



3. Stop Spindle—Cross Mill Flats—Support



4. Start Spindle—Shave Rear Dia.

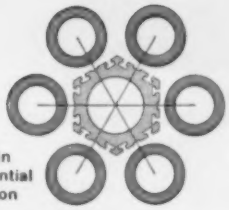
5. Cut off

Close up of tooling zone showing 3rd, 4th and 5th position operations

. . . *in addition* the reject rate is reduced 200% and operator hours slashed 300% in the production of a precision center post component for residential thermostats. What's more, with one machine, one set of tools, and one operator doing all machining in the primary setup, quality control is greatly simplified, and valuable floor space saved. Still further savings result from greatly reduced machine maintenance.

Such drastic savings are possible for Minneapolis Honeywell because of inherent Acme-Gridley features such as independently operated tool slides, the extreme accuracy and flexibility of direct camming, and wide open tooling zones. Rugged and versatile 7/16" Acme-Gridleys fit right in with Honeywell's program of "Total Machine Utilization"; will pay off for years to come by economically accommodating the materials and setups Honeywell requires in the production of small, high quality parts for their precision instruments.

Get the complete story on how Acme-Gridley Automatics provide industry's most modern approach to cost reduction. Call, write or wire.



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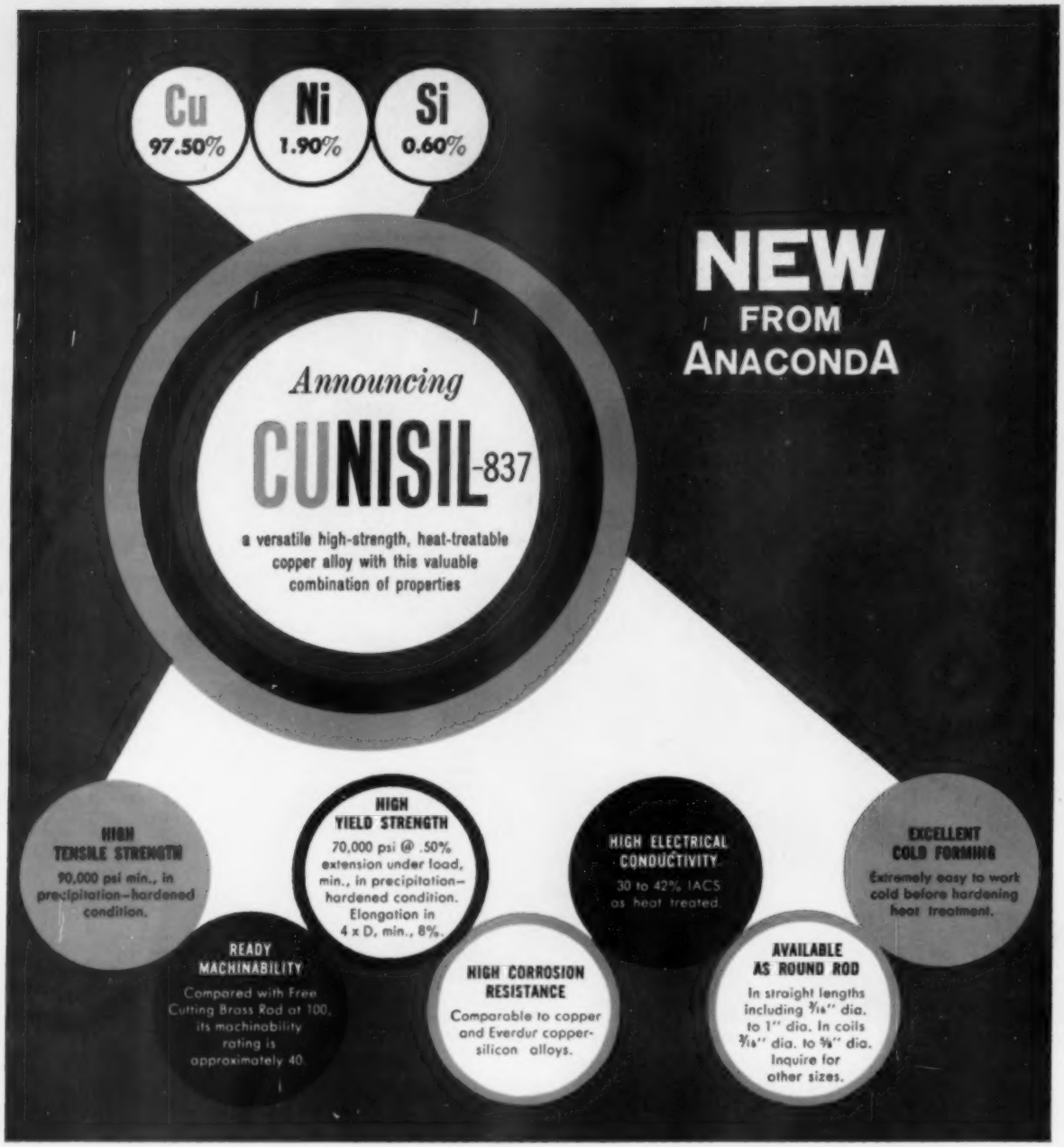
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97.50%
Ni
1.90%
Si
0.60%
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Announcing
CUNISIL-837
a versatile high-strength, heat-treatable copper alloy with this valuable combination of properties
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EXCELLENT COLD FORMING
Extremely easy to work cold before hardening heat treatment.
READY MACHINABILITY
Compared with Free Cutting Brass Rod at 100, its machinability rating is approximately 40.
HIGH CORROSION RESISTANCE
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AVAILABLE AS ROUND ROD
In straight lengths including 3/16" dia. to 1" dia. In coils 3/16" dia. to 5/8" dia. Inquire for other sizes.

METALLURGICAL COMMENT. Most of the nickel and silicon in heat-treated Cunisil are present as an intermetallic compound, nickel silicide, and it is the precipitation of nickel silicide in the form of particles of submicroscopic size by a relatively low temperature heat treatment that accounts largely for the distinctive properties of the alloy.

Prior to the hardening heat treatment, the alloy is brought to a proper condition for hardening by giving it a solution anneal at a much higher temperature and then a quenching from this temperature; at this stage the alloy is quite soft and in a condition for drastic cold-working operations. The hardening heat treatment consists of heating at a controlled temperature for a definite length of time to obtain the desired mechanical properties.

CUNISIL-837 is a high-strength, corrosion-resistant alloy that includes many of the desired qualities of Silicon Bronze or Everdur®. Its applications to date have been primarily in the electrical equipment field.

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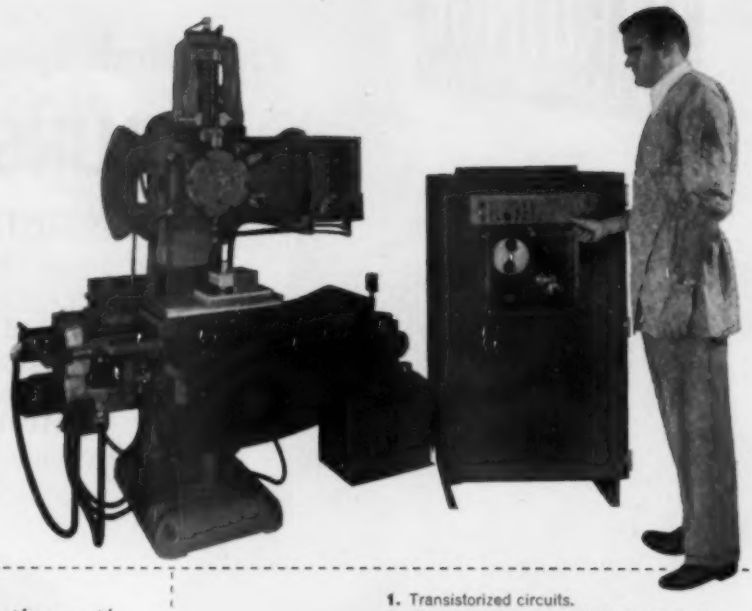
NEW! HUGHES 2-AXIS MACHINE TOOL CONTROL



The new Hughes Machine Tool Control provides you with automatic positioning of a two-axis table plus third axis feed control if desired. Designed for use in drilling, boring, turning, riveting, spot welding, punching, eyelet inserting and other similar operations, the Hughes Control offers you significant tooling and labor savings. It is easily adaptable to new machines or for retrofit.

advantages

1. Simplification of tooling reduces lead time.
2. Precision positioning eliminates expensive tooling.
3. Handling is reduced between operations.
4. High-speed operation reduces the number of machines required.
5. Scrap due to operator errors is reduced.
6. Very large savings are realized in re-run of any given parts order.
7. Eliminates large inventories.
8. Rework of tooling after design changes is replaced by simple modification of machine tape.
9. The new operator produces as much as the experienced operator.
10. Cost estimating is more precise.
11. The inspection burden is greatly eased. All parts are identical.
12. Planning and scheduling is greatly simplified. Many more operations can economically be performed with one machine and one setup.
13. Tape control means the machine delivers high precision work at the same cost as low precision work. Tight tolerances at no extra cost.

advanced features of the new Hughes Products 2-axis machine tool control

1. Transistorized circuits.
2. Mercury-wetted relays eliminate "chatter."
3. Positioning accuracy is ± 0.0005", non-cumulative. Repeatable accuracy: ± 0.0002". Input resolution: 0.001".
4. Compact cabinet occupies minimum of valuable floor space.
5. Third axis of control easily added at nominal cost.
6. Electronic position transducer insures continuing accuracy and reliability.
7. Digital system assures positive, accurate, high-speed positioning at 180" per minute.
8. Modular construction of plug-in units cuts down-time. Spare unit simply inserted for continuous production.
9. Standard 1", 8-channel Mylar tape used in system.
10. Optical tape reader for precise, high-speed information input.
11. Tape is prepared on Hughes Products unit which is simple to operate and low in cost.

other specifications

Travel	Unlimited, except that the maximum movement per block of tape is 39.999 inches.
Axis Control	Two axes simultaneously.
Drive System	"Creep Traverse Drive Unit" to be attached to preloaded ball bearing leadscrew.
Tape	1 inch, eight channel, opaque, perforated tape.
Tape Reading Time	Less than one second during feed axis movements. Does not add to machining cycle.
Drive System Power	1/4 hp (higher power in special unit).
Resolution	0.001 inch.
Auxiliary Functions	24 bits of information available—programmable as six binary coded decimal digits.
Operation Modes	1) Automatic. 2) Set-up (semi-automatic for tape and program checking). 3) Manual.
Power Requirements	110 volt, single phase. Control plus drive motors require less than 10 amps.

For further information on the Hughes Machine Tool Control ... and its application to your specific needs ... please write or wire: HUGHES PRODUCTS, Industrial Systems Division, International Airport Station, Los Angeles 45, California.
For export information, write: Hughes International, Culver City, California.

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The cut-off wheel this man is using is one of the complete Norton line, developed to bring the value-adding "Touch of Gold" to all cutting-off jobs, on all metals and the widest variety of non-metallic materials.

For wet or dry cutting, on manual or automatic machines, Norton cut-off wheels are available in ALUNDUM* aluminum oxide and CRYSTOLON* silicon carbide abrasives . . . in resinoid, rubber and shellac bonds . . . with or without reinforcement of glass cloth, nylon, cotton or combinations of these.

Backed by leadership in abrasive product development, Norton cut-off wheels are recognized as the most efficient, most economical production tools of their type. Your Norton Man, a trained Abrasive Engineer, and your Norton Distributor will be glad to tell you how these "Touch of Gold" benefits can be brought to your own production. NORTON COMPANY, General Offices, Worcester 6, Mass.

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Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

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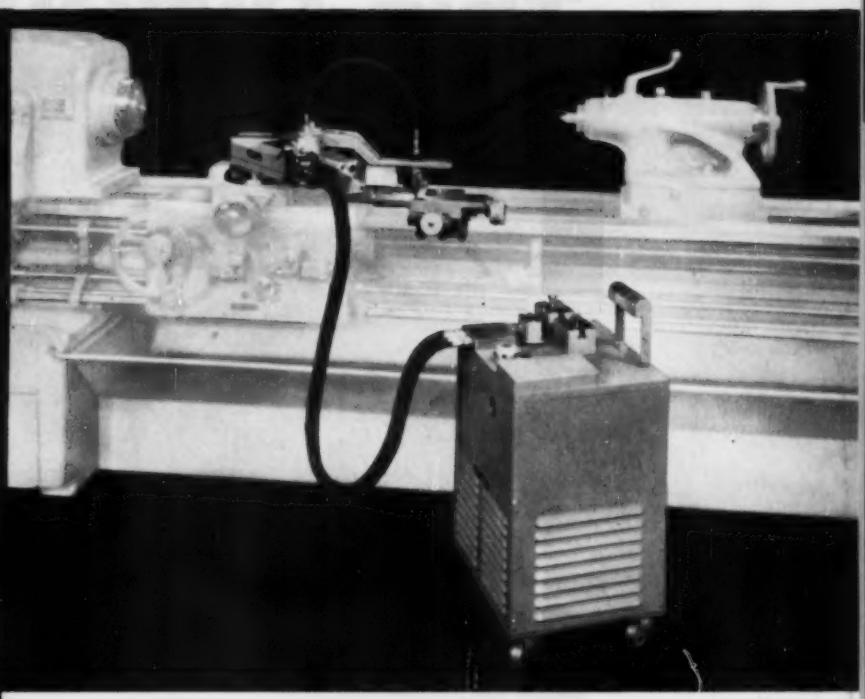


3..The New Air-Tracer Pak... Portable Unit for Standard Monarchs in Your Plant

Here's a real turning technique breakthrough! The Air-Tracer Pak is just what the name implies—a portable, easily applied device for temporarily or permanently adding to many standard Monarchs in your shop *all the advantages of Air-Gage Tracer production.*

And what are those advantages? In a nutshell, this, the most accurate duplicating method in general use, always outproduces manual operation up to 8 to 10 times. It sizes automatically and, using only a single running tool, is ideal for *small lot repetitive work* without the need for expensive form tools or multiple tool setups.

Its accuracy of ± .001" on most work often cuts in half the stock left for grinding; sometimes eliminates grinding and polishing. It allows complete setup change in as little as 15 to 20 minutes and tool change in 1 minute. It is also the simplest, most trouble-free of all lathe duplicating units.

The photos show how the tracer slide assembly quickly replaces the regular compound rest on the cross slide. Note the template support and micrometer dials—the portable, completely self-contained power unit at the front of machine with air supply and electrical connections in the base.

Presto! it's on. And presto! it's off. Yet it's an adaptation of the time-tested swiveling Air-Gage Tracer with the versatility to handle the more complex turning, boring and facing jobs.

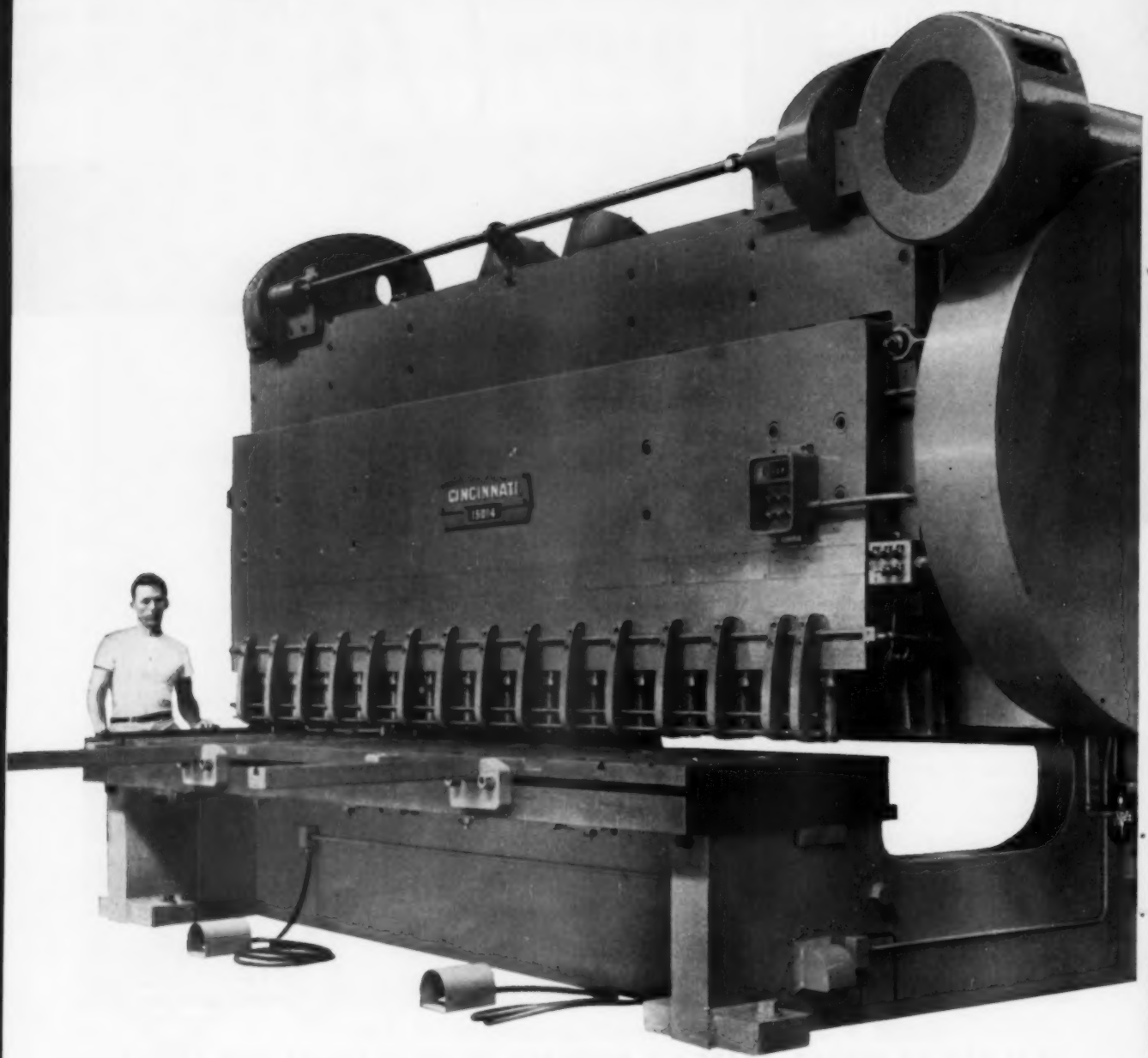
This is news! Write—or phone today—for the full story... The Monarch Machine Tool Company, Sidney, Ohio.

Monarch
TURNING MACHINES

IF IT CAN BE TURNED, THERE'S A MONARCH TO DO IT BETTER AND FASTER

This CINCINNATI®...

1¼ in. thick X



shears mild steel plate

14 ft. long

This 15014 Series Cincinnati All-Steel Shear has a 36″ gap and a 48″ back gage range.

Power for heavy cutting with accuracy and operating convenience are combined in this machine.

Modern features such as — Hydraulic Holddowns, Front Operated Power Back Gage, Hinged Back Gage Angle, Automatic Pressure Lubrication, All-Steel Interlocked Construction, Forged Alloy Steel Eccentric Shaft—all contribute to an outstanding performance with low maintenance and high accuracy.

See your Cincinnati Representative for either Heavy or Light Shearing Applications. Write for Catalog S-7R.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

CIRCLE 204 READER SERVICE CARD

HERE'S LOW COST

Heavier . . . smoother running . . . greater accuracy. Compare features. Only the Reid grinders offer you so many quality extras. Designed by Reid Bros., the most respected name in Surface Grinders . . . since 1901.

DUST GUARDING . . . Neg'-ator stainless steel roll type dust guards.

WORK HEIGHT . . . a full 15¼" from top of table to bottom of 7" wheel.

REID PRECISION

REID 618 P
POWERED MODEL

REID GERMANIUM
SLICING MACHINE

REID-O-MATIC 824
ALL ELECTRIC MODEL

REID ELECTROLYTIC
SURFACE GRINDER

PRECISION GRINDING

WITH REID'S NEW HAND FEED MODELS 612 AND 618HA

More stability . . . *more* work height . . . *more* grinder, dollar for dollar!

These models are twice the weight of typical grinders in this size. Heavy, rugged construction eliminates vibration and resulting rejects. Reid hand feed grinders feature a full 18" center distance on the cross slide ways, *too* . . . another factor for greater stability.

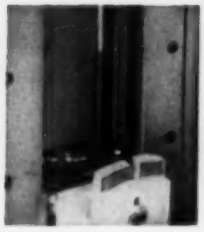
Vertical work height is now a whopping 15¼" from the top of the table to the bottom of the 7" wheel. The entire head and head way are dovetail mounted and designed for years of trouble-free use. Check the finger tip controls, underguarding, one-shot lubrication and a dozen other Reid features.

Dollar for dollar, you'll agree REID grinders are your soundest investment for your toolroom grinding.

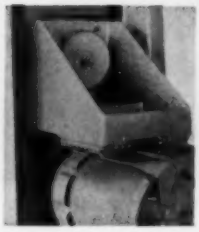
- Heavier than comparable grinders
- Longer ways for stability and wear
- 18" Center distance on cross slide ways
- Full 15¼" work height with a 7" wheel
- Sealed anti-friction bearings
- More horsepower
- Belt driven or motorized spindle available
- Cross slide lock standard equipment

SPECIFICATIONS

CAPACITY	7" (wide) cross slide travel 14" long table travel (612) 20" long (618HA) 15¼" vertical height from top of table to underside of 7" wheel
OVERALL HEIGHT	68"
BELT DRIVEN SPINDLE	1 H.P. Motor 3450 RPM Spindle 2950 or 3450 RPM
MOTORIZED SPINDLE	1 H.P., 3450 RPM offered at slight additional cost
NET WEIGHT	1425 lbs. (612) 1525 lbs. (618HA)
LUBRICATION	One-shot system included as standard equipment. Automatic lubrication available at extra cost.
OPTIONAL EQUIPMENT	I.I.C. and/or 110 Volt Controls
CHROME WAYS	



HEAD & HEAD WAY . . . dovetail mounted. The Head can be driven in both directions.



BELT DRIVEN SPINDLE . . . utilizes 1 H.P. 3450 RPM. Double sheaved to permit 2950 RPM or 3450 RPM spindle speed.

MOTORIZED SPINDLE . . . optional, can be furnished at slight increase in cost. 1 H.P. — 3450 RPM.

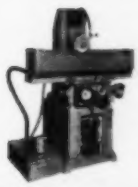
ONE-SHOT LUBRICATION . . . Bijur system for all way surfaces. Non-clogging. Convenient.

HANDWHEELS . . . all conveniently located. Full 9" Table handwheel less tiring . . . may be disengaged, rotated to any desired position, re-engaged.

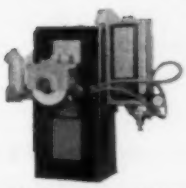
SURFACE GRINDERS

PRECISION SURFACE REID GRINDERS

Manufacturers of precision surface grinders for production and toolroom needs



REID 618 PT WITH WET GRINDING ATTACHMENT

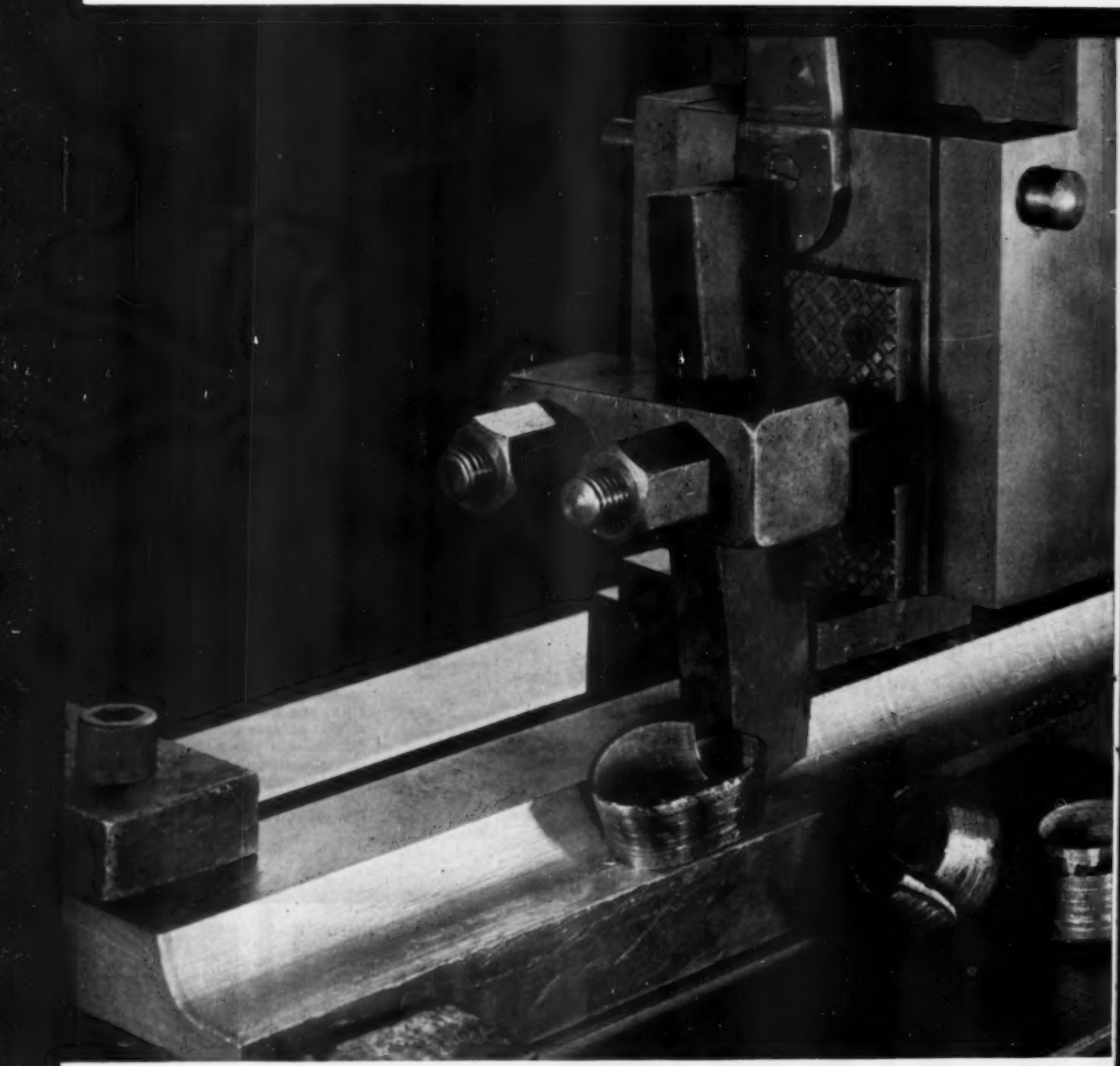


REID COOL GRINDING ATTACHMENT SHOWN ON COLUMN.

REID BROTHERS COMPANY, INC.
159 ELLIOTT STREET • BEVERLY, MASSACHUSETTS

Write for descriptive literature . . . specify model: 612 618HA

CIRCLE 206 READER SERVICE CARD



Machining gib for heavy duty lathe from cold rolled steel. Depth of cut: ¾"; feed: .060"

The Big Cut without the Big Cost

You can pay more, but you can't buy greater power and accuracy than is yours with a reliable Smith & Mills Shaper. In fact, even if you spend thousands of dollars more, you will not obtain all the advantages that Smith & Mills offers.

Throughout continuous high speed operation, using heavy feeds and maximum power, a Smith & Mills Shaper holds limits and resists deflection. The reasons are apparent . . . Solid Ram, unequalled for heavy duty, high production work . . . Patented Self-Locking Ram Adjustment for one-step positioning (even when reciprocating) and complete backlash elimination . . . exclusive "Solid Unit" Bull Gear Assembly . . . ram, rocker arm, bull gear and other critical components made of nodular iron.

Compare . . . feature for feature . . . cut for cut . . . cost for cost! Prove to yourself that a Smith & Mills Shaper offers all the power, accuracy and versatility of the expensive shapers, yet costs hundreds, even thousands of dollars less. Write today for details and specifications.

SMITH & MILLS

SHAPERS

CIRCLE 207 READER SERVICE CARD

Division of NEBEL
Machine Tool Corporation

3407 Central Parkway, Cincinnati 25, Ohio

SHORT TOOL LIFE due to chip weld, cratering and burning, in many cases, has been traced directly to lube oil dilution of cutting oil effectiveness. Cleartex can end this problem forever.

Diluted cutting oil shortens tool life drastically

Lubricating oil is probably leaking into the cutting oil sumps of your automatic screw machines as you read this. Current research proves that this is happening in 70% of all the automatics in use today! And where it happens, it shortens tool life by as much as 50%—even 70%. On top of this, the cost of extra regrinds, lost production during tool changes, and excessive scrap production is putting a premium on screw machine operation in too many shops.

Look for these symptoms. One sure sign of dilution is the need for frequent refilling of the lube oil sump. If you are using an ordinary lube oil, this dilution will create two additional—and more costly—symptoms: excessive scrap production and frequent regrinds. Now you can eliminate these forever with the

TEXACO CLEARTEX CURE

The exceptional chemical stability and load-carrying ability of Texaco's Cleartex series make them equally suitable for use as cutting oils, lubricants or hydraulic fluids. All you have to do is use them for both cutting *and* lubrication. With Cleartex in *all* your sumps, you'll find cutting oil dilution will stop and screw machine production cost will drop substantially.

Write today for your copy of Texaco's helpful new booklet "Cleartex in Automatic Screw Machines"... and contact your local Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. AM-23.

TUNE IN: Texaco Huntley-Brinkley Report, Mon.-Fri.—NBC-TV

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

CIRCLE 207 READER SERVICE CARD

SHAPERS

3407 Central Parkway, Cincinnati 25, Ohio

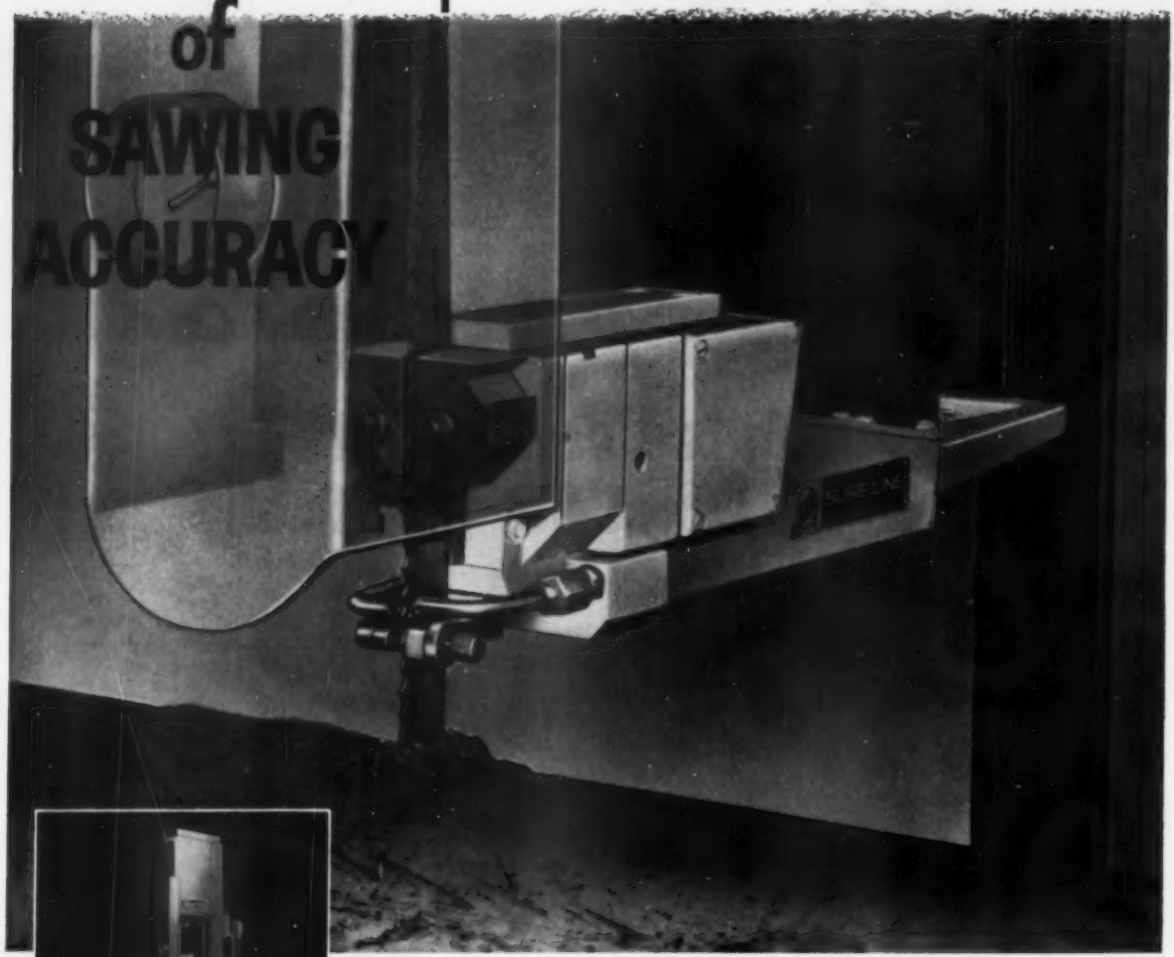
MARVEL *GUIDANCE SYSTEM** ...SECRET of SAWING ACCURACY

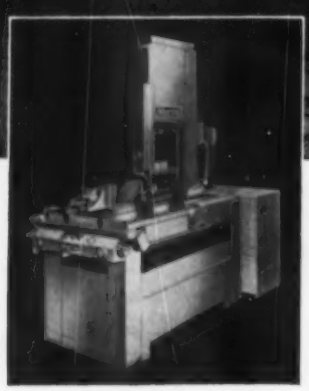
A new MARVEL invention—the "Sure-Line" Automatic Blade Controller—*at last* attacks the problem of maintaining accuracy in high speed band sawing.

This simple, but effective electro-mechanical guidance system invented and developed by MARVEL, actually "steers" a band blade while it is cutting, to maintain a straight path!

Designed as an integral part of, and available only in the new MARVEL 81 Series All Hydraulic Band Saws, the "Sure-Line" guidance system continuously senses and automatically corrects any tendency of a band blade to cut inaccurately. Now—with the MARVEL "Sure-Line" guidance system, every square inch of cutting life is squeezed out of each blade. The result: longer blade life, and cutting costs lowered to a point that makes high speed production cutting-off with a band saw economically practical.

A demonstration of the new MARVEL No. 81 All Hydraulic Band Saw will prove it. Write today for the complete story, and ask about a demonstration.





*SURE-LINE AUTOMATIC BLADE CONTROLLER (BASIC PATENT APPLIED FOR)

ARMSTRONG-BLUM MFG. CO. 5700 W. BLOOMINGDALE AVE. • CHICAGO 39, ILLINOIS

MARVEL Metal Cutting SAWS

Better Machines–Better Blades

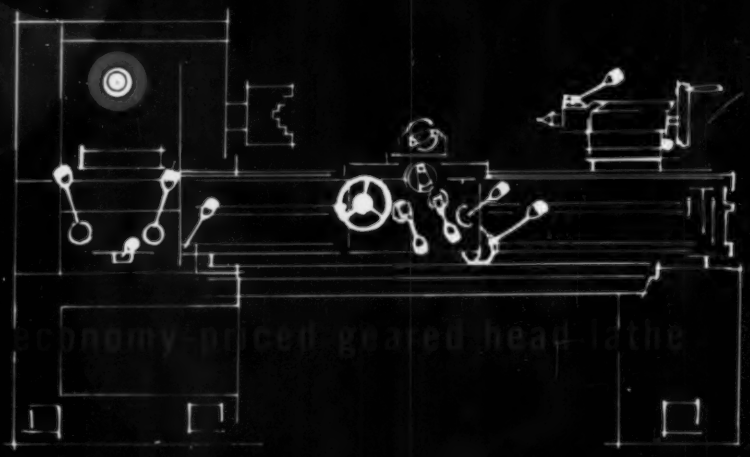
CIRCLE 209 READER SERVICE CARD

CIRCLE 210 READER SERVICE CARD ▶

new

new

from cincinnati
lathe and tool....



the first economy priced geared head lathe

with power dial speed shifting

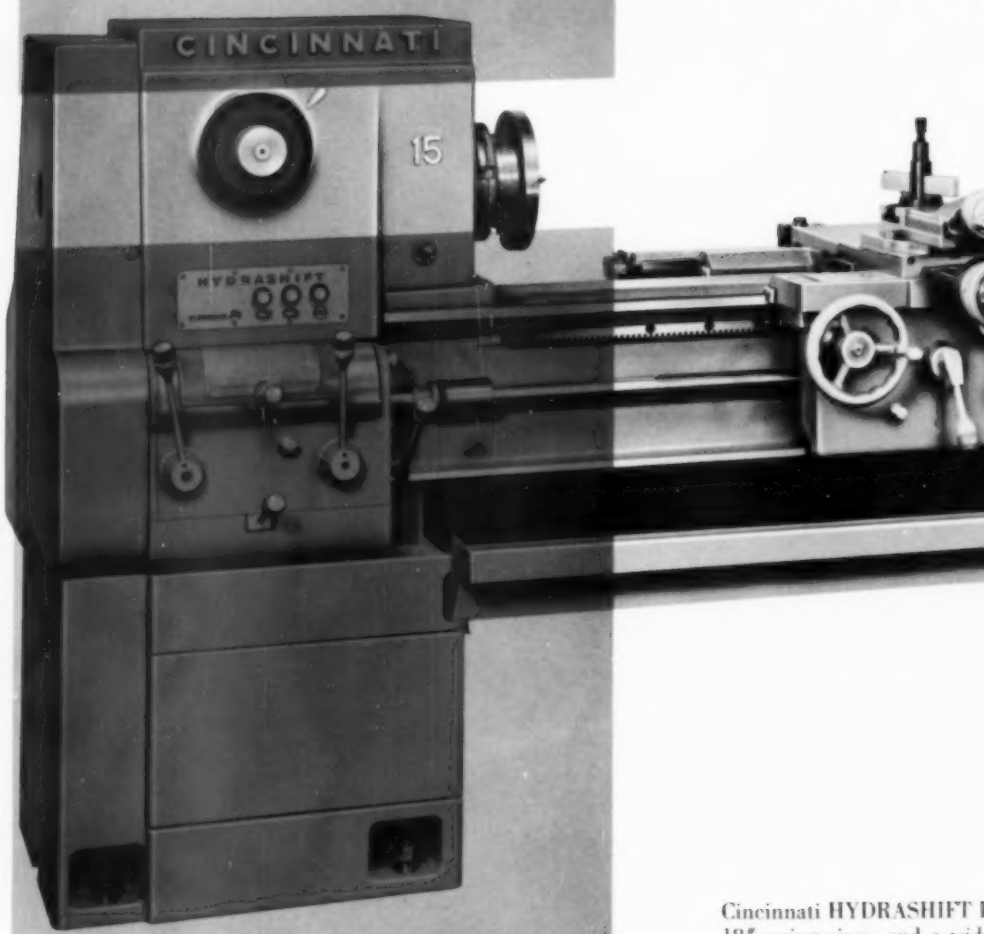
cincinnati hydrashift

hydraulic power supplie

new
new
new

cincinnati hy

hydrashift, the e
geared head lathe, cuts ma
work. To change spindle s
hydraulic power does the shi



Cincinnati HYDRASHIFT
18" swing sizes, and a wid
sizes may be equipped wi
for even greater productivi

Ask your CL&T Dealer to
from CINCINNATI, or write

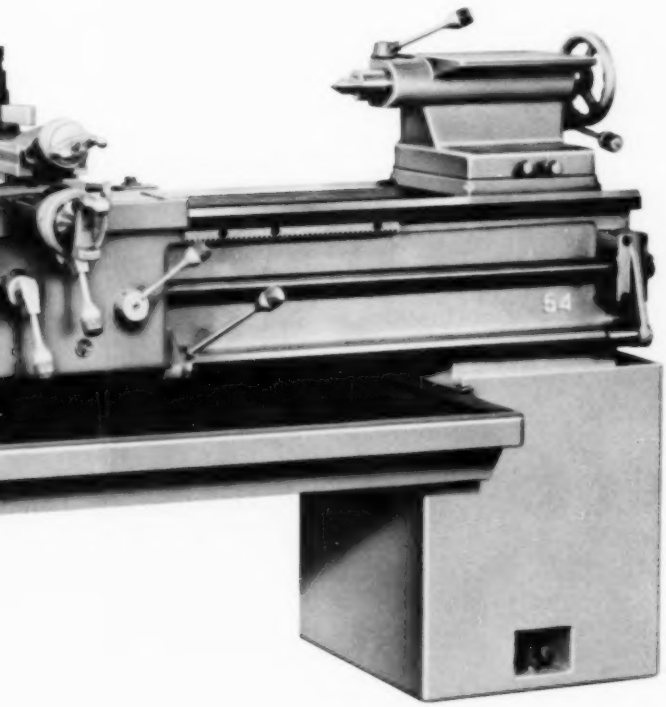
cincinnati lathe and tool c

"HYDRASHIFT" Lath

lies the muscle on

hydrashift

, the easiest and fastest method for spindle speed shifting on a
uts machine handling time . . . lets the operator produce more
ndle speeds, the operator has only to dial the desired RPM . . .
the shifting.



These CINCINNATI LATHES are NEW—from headstock to tailstock! They are designed to provide more time for cutting and to reduce operator fatigue to a minimum. Yet, with their many new operating features, they are still economy priced.

new High Speeds with All-Geared Headstock—husky, Hydrashift gearing provides 12 speeds in geometric progression up to 3000 RPM.

new Compound and Cross Slide—wider, heavier bridge, compound and cross slide for heavy, high-speed cuts; large, easy-reading dials for new accuracies with greater operator speed and convenience.

new Quick-Clamping Tailstock—Cincinnati's unique tailstock design is even more versatile for fast tailstock positioning.

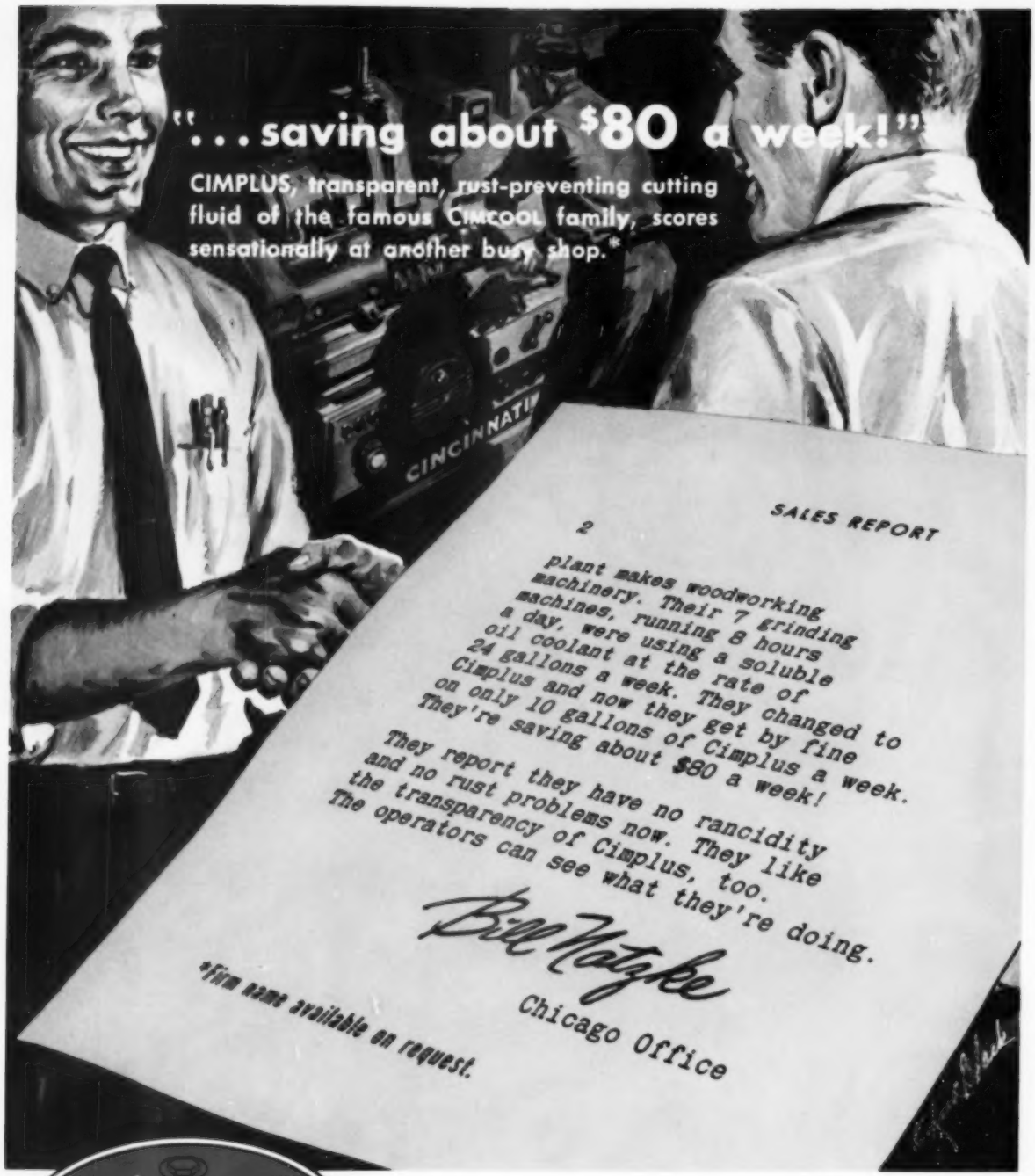
plus **new** greater horsepower . . . NEW husky beds with "Hardclad" flame-hardened ways . . . NEW coded push-button controls . . . NEW chip pan (slides in and out for convenient cleaning) . . . Totally enclosed quick-change feed box with 48 threads and feeds . . . and many other exclusive features on the NEW CINCINNATI HYDRASHIFT LATHES.

HIFT Lathes are built in 10", 12½", 15" and
a wide variety of bed lengths. 15" and 18"
ed with Cincinnati HYDRAGUIDE tracers
luctivity.

aler today about this exciting new development
r write to us direct.

CO. 3207 disney street, cincinnati 9, ohio

Lathes / "CINCINNATI" Drilling Machines / "SPIROPOINT" Drill Sharpeners


"...saving about $80 a week!"
CIMPLUS, transparent, rust-preventing cutting fluid of the famous CIMCOOL family, scores sensationally at another busy shop.*
CINCINNATI
SALES REPORT
2
plant makes woodworking machinery. Their 7 grinding machines, running 8 hours a day, were using a soluble oil coolant at the rate of 24 gallons a week. They changed to Cimplus and now they get by fine on only 10 gallons of Cimplus a week. They're saving about $80 a week!
They report they have no rancidity and no rust problems now. They like the transparency of Cimplus, too. The operators can see what they're doing.
Bill Matzke
Chicago Office
*Firm name available on request.

FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL S2 Concentrate—The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL—newest in the famous, industry-proven line of CIMCOOL® Cutting Fluids!
CIMPLUS—The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS)—For every job requiring an oil-base cutting fluid.
ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

Announcing ...a fully-automatic precision DRILL POINTER

the

Model 100 WINSLO-MATIC DRILL POINTER

See the **WINSLO-MATIC DRILL POINTER** in operation at the National Metal Show in Chicago — Booth 1362

THE ONLY DRILL POINT GRINDING MACHINE WITH ALL OF THESE OUTSTANDING FEATURES AND ADVANTAGES

- **FULLY-AUTOMATIC CYCLE — INCLUDING EJECTION OF DRILLS**
- **WILL GENERATE HELICAL OR CONVENTIONAL POINTS**
- **DRILL POINTS CONCENTRIC WITHIN .0002**
- **HIGH PRODUCTION RATE — CYCLES IN 3 SECONDS**
- **PACESETTER ADJUSTER SETS INTERVAL BETWEEN CYCLES**
- **LOCATES ON THE POINT — NO ADJUSTMENTS REQUIRED FOR VARIATIONS IN DRILL LENGTHS**
- **FULLY AUTOMATIC SELF-COMPENSATING WHEEL DRESSER**

Here is one of the most sensational machines ever to be introduced to industry! The Model 100 WINSLO-MATIC DRILL POINTER produces *automatically and with extreme precision*, the Winslow Type 4 drill points or other helical (self-centering) points, as well as conventional points. And in addition, the drill point on most drill countersinks can be sharpened with this machine.

Forms are generated by means of a combination of 2 cam movements. The drill point angle is formed on a 20" diameter grinding wheel. The number of drills pointed between automatic dressings is pre-determined by a selector switch. The WINSLO-MATIC DRILL POINTER operates on a single source of power (electrical). Grinding wheel and work-head are well guarded to retain coolant and spray, assuring a clean, anti-splash operation. Unit occupies only 36" x 48" floor space. Work-head is at convenient level for maximum ease of operation.

No other machine can match the precision, production and labor-saving advantages of the revolutionary WINSLO-MATIC DRILL POINTER. Write for full details today!

WRITE TODAY ...for WINSLO-MATIC DRILL POINTER Bulletin and name of your nearest dealer.

Winslow PRODUCT ENGINEERING CORPORATION

47 ST. JOSEPH STREET · ARCADIA, CALIFORNIA

Manufacturers of power hand tools and accessories for the nation's aircraft and manufacturing plants.

THREE OTHER WINSLOW POWER TOOLS YOU SHOULD KNOW ABOUT...

SPACEMATIC DRILL MOTOR An extremely versatile tool that drills, reams and countersinks in a single operation.

NUTPLATE DRILL MOTOR A portable power tool used on Nutplate installations.

SPACEMITE DRILL MOTOR A heavy-duty tool that replaces angle drills for limited-access-area drilling.

◄ CIRCLE 213 READER SERVICE CARD

CIRCLE 214 READER SERVICE CARD

CENTERLESS

"Wheels of Profit"

by MACKLIN

MACKLIN Centerless Wheels are available in a complete range of sizes and gradings. Standard and special regulating wheels are also available.

for uniform, HIGH SPEED PRODUCTION

Whether you finish bolts, bars, rods or tubes . . . bearings, tappets, pistons or piston rings . . . twist drills or plastic parts . . . you can depend on Macklin centerless wheels to turn out *identically* ground pieces quickly and economically.

They cut cool and sharp. They have good balance. Uniform dispersion of abrasive grain through the wheel enables you to hold part size uniformly and to obtain good finish.

HERE'S PROOF

ROUGH GRIND PINION SHAFT "Good stock removal. Finish excellent. Have standardized on this wheel."
20x6x12 C60 L5 V8

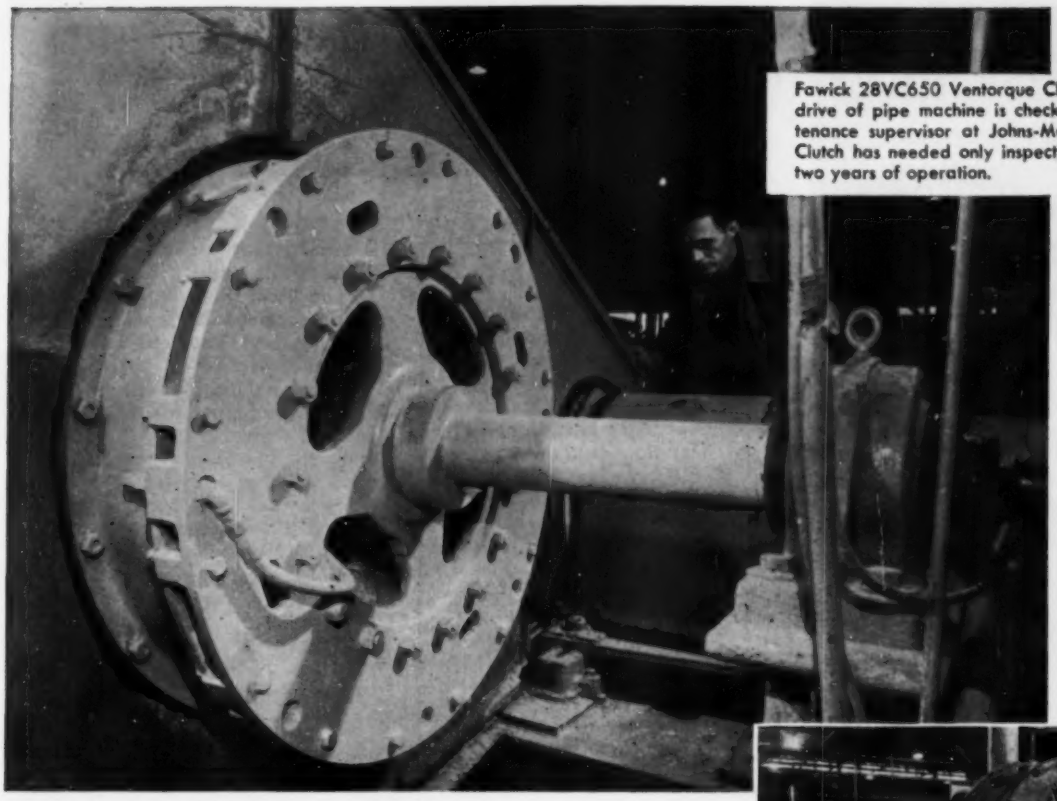
FINISH HIGH SPEED CARBON DRILLS "Wheel very satisfactory. Production increased materially."
20x8x12 18A 100 N5 V6

It Will Pay You TO CONSULT WITH YOUR MACKLIN DISTRIBUTOR. OR, IF YOU PREFER, WRITE DIRECT. *ASK FOR BULLETIN CW59.*

GRINDING WHEELS

MACKLIN company Dept. 70, Jackson, Michigan

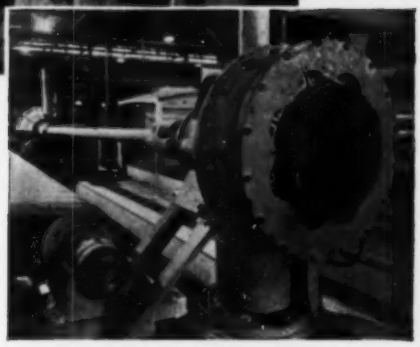
CIRCLE 215 READER SERVICE CARD



Fawick 28VC650 Ventorque Clutch on main drive of pipe machine is checked by maintenance supervisor at Johns-Manville plant. Clutch has needed only inspection during its two years of operation.

Like Johns-Manville Transite Pipe Plant, you can...

use Fawick Clutches to improve machine performance and reduce maintenance costs



Fawick 11.5VC500 Ventorque Clutch locks press roll on pipe machine to desired pressure for special Transite pipe production. Precise operation despite heavy dust load helps machine keep pace with production schedules.

Machines producing Transite pipe give clutches a rough going-over: sudden, high-impact starting loads . . . rapid build-up of abrasive cement and asbestos dust . . . accurate cycling requirements . . . 'round-the-clock operation six days a week. Tougher conditions would be hard to imagine. Yet, FAWICK Airflex Clutches at Johns-Manville deliver dependable performance and meet increasing production demands with no maintenance or downtime. Some have been installed for over six years with only routine inspection.

Reasons for this record lie in the design of FAWICK Clutches:

- operation of FAWICK Drum Type Clutch unaffected by foreign material.
- durable drum-type construction takes years of punishment.
- rubber air tube cushions operating shocks.
- self-adjusting friction shoes automatically compensate for wear.
- mechanical linkages have been eliminated to provide smoother, more accurate operation.

These are the proof—for long clutch life and trouble-free service, you can't beat a FAWICK Clutch. For more information, contact your nearest Fawick representative or the home office.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON RD. • CLEVELAND 11, O.
In Canada, Fawick Canada, LTD., Toronto

FAWICK Airflex

INDUSTRIAL CLUTCHES AND BRAKES

SPEED-BAND®
the newest concept in band saw blades—made from L-100-M, a double carbide alloy developed *especially* for band saws. Its hot hardness and abrasion resistance effect extraordinary results.

Available only from Capewell Distributors, of course

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Buyers' Guide Error

Through an unfortunate error, the distributors for Elmes Engineering Div, American Steel Foundries, were listed under King Machine Tool Div, American Steel Foundries, and those for King were listed under Elmes in the Machine Tool Distributor section of our recently published Buyers' Guide issue.

We regret the inconvenience this error may have caused for the distributors and for readers who have directed inquiries to the wrong source, and suggest that you make a cross-over note in your copy. You will find Elmes on p586, and King on p598

Vacuum die casting clarified

Dear Sirs:
The paragraph on our Vacucast system in "Metalworking Report" (AM—Aug 10 '59, p2) certainly presents it in an unfavorable light. It implies that the system is obsolete and no longer being offered. As you know this is not true; we have continued to promote our Vacucast and Vacufeed systems in our advertising program.

The item states that our system "... was expensive, requiring the entire die area to be shrouded—and vacuum of only 18 in. of mercury could be drawn."

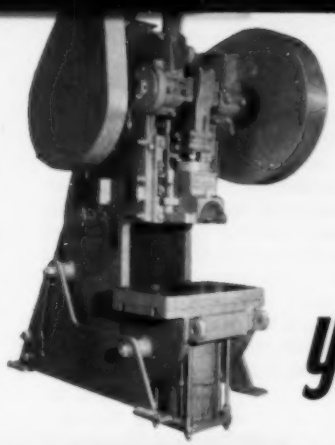
The initial cost of our system is relatively expensive ($11,000 vs about $3600), but in the long run it is often more economical than the other systems which evacuate air from the die only. With those systems it is necessary to alter each die. Depending upon the complexity of the die and the modifications to be made, this costs anywhere from $1000 to $3500.

Therefore, if several dies are altered it doesn't take long to reach or exceed the price of our Vacucast system which does not require modification of dies. The "Metalworking Report" item makes no mention of the necessity of altering dies so that they will operate with these other vacuum systems.

Where our Vacucast and Va-

SHOPMATES

N. Jarvis



for grass roots economy you just can't match this OBI

Cold, hard statistics leave no doubt. Wherever performance data and cost records are compared, the Series A Inclinable is way out front in parts produced per dollar expended.

On the most demanding jobs ... where the clutch is engaged and disengaged at every press stroke ... where three-shift operation continues day after day ... *no OBI can even approach it in thrifty operation, fool-proof simplicity, and safety.* Readily understandable are the reasons why:

Niagara's famed, multi-point mechanical sleeve clutch picks up the load on 14 engaging jaws, applying the driving force concentrically without keys or pins. Instant engagement and maximum productive strokes per minute are assured.

There are no complicated electrical circuits, relays, limit switches or solenoids . . . no palm buttons, air valves or rotary air connections. In fact no air is consumed.

With fewer parts and simpler construction, there's less to go wrong, less to repair or replace. As a result, this is not only a more economical press to operate, but a much safer press as well. Records of thousands of presses are factual proof that the Niagara mechanical sleeve clutch is unequaled in safety and reliability.

Built in 13 standard sizes, with shaft diameters from 1¼" to 6½" and capacities from 5½ to 190 tons, Niagara Series A Presses can be readily equipped with numerous accessories for individual requirements.

GET THE FACTS AND FIGURES. WRITE FOR NEW BULLETIN 58N

NIAGARA

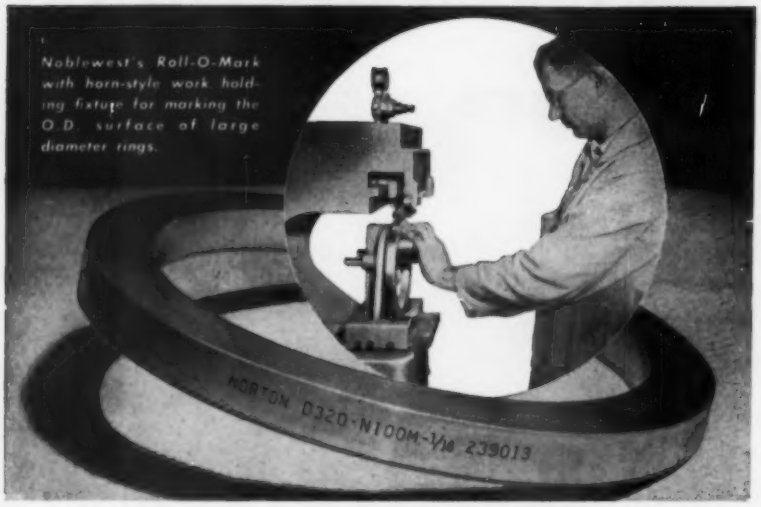
NIAGARA MACHINE AND TOOL WORKS · BUFFALO 11, N. Y. District Offices and Distributors Everywhere

CIRCLE 218 READER SERVICE CARD

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

HEAVY DUTY ROLL-O-MARK

MULTI-PURPOSE METAL MARKING MACHINE



Noblewest's Roll-O-Mark with horn-style work holding fixture for marking the O.D. surface of large diameter rings.

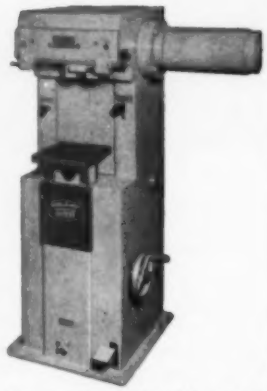
FEATURES

- Extra large work capacity
- Greater versatility
- Marks, numbers, graduates, embosses
- Low operating cost

Marking the surface of large diameter rings is just one of the many applications that are being done faster, better and at lower cost in many industries today with the new heavy duty all-pneumatic Roll-O-Mark. This one machine can be tooled for marking round or flat surfaces . . . precision graduating . . . serial numbering . . . knurling . . . and embossing. Whatever your needs for metal marking, Noblewest makes the machines, marking dies, and work-holding fixtures for doing the complete job. And remember, Noblewest Roll-Marking is *permanently indented* marking—*good for the life of your product.*

Write for new catalog. The Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Connecticut.

A few desirable territories open to qualified representatives.



All-pneumatic, Model 365 is the heavy duty version of the famous Model 50P1.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING
NUMBERING
EMBOSSING
GRADUATING

cufeed systems have been installed, they are doing an excellent job on both zinc and aluminum. However, it requires quite an educational job to convince die casters that our systems will save them money in the long run. As part of our educational program, we have prepared a little Question and Answer booklet on vacuum die casting, and I am pleased to enclose a copy herewith.

G W McIntyre, Jr,
advertising manager
Reed-Prentice Division of
Package Machinery Co
East Longmeadow, Mass

We were pleased to receive Reader McIntyre's clarifying comments on the vacuum systems offered by Reed-Prentice and to read the Question and Answer booklet on vacuum die casting.

The booklet is available without charge, and any readers who would like a copy can secure one by circling No. 50 on the Reader Service Card—Ed.

Sketching

Dear Sirs:
Please advise if reprints of the article titled "Sketching for Everyone" (*AM*—May 18 '59, p147) are still available for purchase.

W E Pomeroy
Birmingham, Ala

Yes they are. Our Reader Service Dept has them at 25¢ per single copy—Ed.

"We've been making a mistake in your withholding for six months—this week you owe us five bucks!"

CALENDAR

Metal Treating Institute—Annual Fall Meeting, Nov 6-7, Sheraton Hotel, Chicago, Ill.

National Screw Machine Products Association — Fall Membership Meeting, Nov 14-18, Americana Hotel, Bal Harbor, Fla.

International Automation Congress & Exposition, Nov 16-20, New York Trade Show Building, New York, NY.

Packaging Machinery Manufacturers Institute—National Exposition, Nov 17-20, Coliseum, New York, NY.

American Society of Mechanical Engineers — Annual Meeting, Nov 29-Dec 4, Chalfonte-Haddon Hall, Atlantic City, NJ.

Drop Forging Association—Winter Meeting of Members, Dec 6-9, Savoy Hilton Hotel, New York, NY.

Joint National Symposium on Reliability and Quality Control—Jan 11-13, Statler-Hilton Hotel, Washington, DC.

Plant Maintenance & Engineering Show & Conference—Jan 25-28, Convention Hall, Philadelphia, Pa.

Society of Vacuum Coaters—Annual Meeting, Jan 26-27, Hotel Biltmore, New York, NY.

Instrument Society of America—Instrument-Automation Conference and Exhibit, Feb 1-5, Houston Coliseum, Houston, Texas.

Society of the Plastics Industry—Reinforced Plastics Div Conference, Feb 2-4, Edgewater Beach Hotel, Chicago, Ill.

Armour Research Foundation and American Welding Society—Annual Midwest Welding Conference, Feb 3-4, Illinois Tech Chemical Bldg, Chicago, Ill.

American Society for Metals—Golden Gate Metals Conference, Feb 4-6, Fairmont Hotel, San Francisco, Calif.

American Institute of Mining, Metallurgical, & Petroleum Engineers—Annual Meeting, Feb 14-18, Statler and McAlpin Hotels, New York, NY.

MODEL B5

New Thread Rolling Attachment for # 00 *Brown & Sharpe*

- *Reduces Pressure on Spindle*
- *Produces Higher Quality Threads on steel, brass and aluminum*
- *Increases Threading Capabilities*
- *Eliminates Secondary Operations by Threading Behind Shoulders*
- *Threads Rolled Close to Collet*
- *Reduces Inspection Costs*

With this latest Reed Attachment the threading capacity of your #00 Brown & Sharpe can be greatly increased. The attachment has a diameter capacity of up to 1/16 inch and maximum thread length of 1/2 inch. It is easy to set up and operate and precision adjustments assure accurate matching and positioning.

REED RTD TRA-174

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

HOLDEN, MASSACHUSETTS, U S A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

CONTROL Costly Eye Accidents...

WITH INEXPENSIVE Safety Glasses Like These

When you give your employees American Optical safety glasses such as our Ultrascopic line, you obtain results! One user reports savings as follows:

1 Lost production time and medical costs *down* from $5.17 per year per employee to $ .56.

2 Lost production time per employee per year *down* from 1.67 hours to 1/10th of an hour.

3 Lost production hours in dollars *down* from $3.36 per employee to $ .23.

Ask your Safety Director about these safety glasses. He knows there is no substitute for quality in safety! Your nearest AO Safety Products Representative can supply you.

AO SAFETY GLASSES LOOK GOOD ON THE WORKER — AND THE SAVINGS LOOK GOOD ON YOUR BOOKS!

Always insist on the AO Trademark on lenses and frames.

American Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASSACHUSETTS
Safety Service Centers in Principal Cities

Ask your Safety Director about these safety glasses. He knows there is no substitute for quality in safety! Your nearest AO Safety Products Representative can supply you.

"Our first Natco ran twelve years without an overhaul!"

— says Harry L. Morley, plant manager of Alloy Steel Products Co.

(see other side)

From this job drilling four 1¼" holes in a stainless steel casting . . .

The operator changes the set-up to eight ⅞" drills in new locations . . .

And starts up again on the new job with only 15 minutes downtime.

"We can change set-ups in 15 minutes or less."

Now, five multiple-spindle Natcos keep production moving at Alloy Steel Products Company, Linden, N.J. Aloyco makes industrial stainless steel valves for the chemical, petrochemical, synthetic fiber, missile and atomic power industries.

Ideal for stainless—Aloyco's materials are hard-to-machine stainless and corrosion-resistant alloys. The steady hydraulic pressure of Natco machines keeps the tools moving into the work and gentles them through the critical break-through point. There's no ease-up to let work hardening start. Drill life stretches out.

Ideal for short runs— Aloyco's production runs aren't long, ranging from 10 to 400 pieces (100 pieces is average). With such short runs, fixtures have to be simple to pay off.

Ideal for cutting costs— An inexpensive guide plate is C-clamped on the face to be drilled and they see no need to fasten the part to the table. Natco C3Bs' accurate alignment, rigidity, lack of vibration and steady feed pressure frequently make permanent fixtures unnecessary.

With a single Natco multiple-spindle machine in your plant you add the productivity of a whole battery of specialized drilling, tapping, and boring machines. Call your Natco representative today.

NATCO

Multiple-spindle drilling, boring, facing and tapping machines.
Special machines for automatic production. Injection molding machines.

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, INDIANA

SPOT NEWS...

- **Military orders for steel will get top priority after production is resumed.** New government directive states mills can ship to civilian customers only when military orders have been filled "54 days after production is resumed, or the end of the following month, whichever is later."

- **A new electron-beam welder,** introduced at the European Machine Tool Exhibition by Sciaky, France, makes circular or longitudinal welds—can have rotary indexing table to hold several workpieces per load. Sciaky Bros, Inc, (Chicago) has license from French AEC to make the equipment here, has built several, has orders for more.

- **Europe's automobile market will exceed that of the United States** somewhere between 1970 and 1975, according to Chrysler's L L Colbert.

- **Shear forming machine** to handle work 96 in. in diameter and 120-in. long has been ordered by Lockheed Aircraft for its Sunnyvale, Calif, missile plant. The Hufford Spin Forge will be rated at 200,000-lb force and is capable of operating with mandrels heated to 1000 F. It should be ready for operation next summer. An even larger shear-forming machine (to handle 10-ft diameters) will be installed later on the West Coast.

- **Russia's first automatic line for production of electric motors** has just gone into operation at Baku. It's 92 ft long, consists of 250 machine tools, requires one-sixth the number of workers as the line it replaces, has upped output 250%, has saved 5380 sq ft of floor space.

- **Shipment of British steel to Red China will start this month.** First order: $2.8-million for 2000 long tons of sheet, bar and plate to be delivered by Firth-Vickers Stainless Steels Ltd by the end of April.

- **Justice Dept is being asked to investigate "a dangerous monopoly"** developing in the scrap steel industry. Under fire is Luria Bros & Co, which dominates the policies of the Institute of Scrap Iron & Steel, according to a report by the Senate Small Business Committee.

- **A press designed to use explosives as a power source** is being developed by an aircraft company. Tests have reportedly reached the working model stage, but no decision has been made as to whether to attempt a full-size machine for explosive forming.

- **Russians are said to be constructing an all-plastic screw-cutting lathe** which will have less deformation under thermal stress and greater resistance to wear than any metal lathe, and will also be more precise, cost less, last longer and operate more quietly.

- **Cuba plans to produce its own automobiles,** expects to have the first one on display in March 1960. Engines and parts for the car will be produced by small shops all over Cuba. The car will get 42 miles per gallon, hit a top speed of 55 mph, sell for about $1500.

- **A U S maker of medical and scientific instruments,** Chicago's Coleman Instruments Inc, has been advised by its 11 foreign distributors to either build a manufacturing plant in Europe (on F uropean Common Market soil) or be forced out of the foreign market by overseas competition.

New SHEFFIELD "Centerfind"

Assures PRECISE ALIGNMENT for Jig Grinding or Boring

"Centerfind" enables an operator to align a work part hole precisely with the jig bore or jig grinder spindle axis.

A pressure-sensitive pick-up stylus is rotated by the spindle to tram the inner surface of the work part hole. As the stylus moves through its orbit, any change in pressure on it indicates misalignment and this is registered on the column Precisionaire. When the hole center is brought into precise alignment, the Precisionaire float remains stationary.

Checking is done while the spindle rotates, thus eliminating torque error which is a serious obstacle when alignment is attempted from a stationary spindle.

Because spindle-to-stylus distance approximates boring tool length, variations caused by vertical quill movement are minimized.

In addition to the reasons above, the high degree of accuracy obtainable with "Centerfind" is due to having only one moving part and the high amplification of the Precisionaire gage.

Other uses for this instrument are the checking of spindle runout and the squareness of a hole with its adjacent face.

"Centerfind" for checking holes up to 5" dia. is recommended to be used with Precisionaire Gages of 2000 or 5000 to 1 amplification. Higher amplifications and larger hole diameter capacity, when required.

For further information, write to The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.

the SHEFFIELD corporation
of Bendix Aviation
manufacture and measurement for mankind

WASHINGTON...

$800-million procurement cut...

The Defense Dept has ordered an $800-million reduction in total procurement contract awards scheduled for the current fiscal year. Pentagon plans for new orders, revised September 11, show anticipated awards totaling $14.1 billion for procurement during July 1959—June 1960. As recently as last May, the plans called for close to $15 billion worth of new orders for military hardware.

These are the big reductions: $180 million less for Navy aircraft; $380 million less for Navy shipbuilding; and at least $200 million less in contracts for Air Force missiles, planes, and other major equipment.

Some of this can be written off as the budget impact of cuts or cancellations already announced—the Air Force's B-58 bomber and F-108 fighter and the Navy's Seamaster seaplane, for instance. But the largest chunk of the $800 million cut in this year's contracting plans represents stretchouts, cuts, or project terminations still to be announced—particularly for shipbuilding.

By trimming scheduled contract awards this year, the Pentagon is trying to hold actual outlays in fiscal 1961 (starting next July 1) to the current $41 billion level.

Key issues in 1961 budget...

As slashes in current military procurement plans are under way, the Pentagon is rushing work on the fiscal 1961 budget which goes to Congress in January.

These are the key issues now being resolved:

- **For the Air Force,** the volume of additional B-52 and B-58 manned bomber procurement—if any—to be authorized next year; production schedules for the liquid-fueled ICBMs—with special attention on the Titan project's future; building Atlas bases underground; and on the rate of development spending for the "future generation" B-70 bomber, Minuteman missiles, and Dyna-Soar spacecraft.

- **For the Army,** the future of the Nike-Zeus anti-missile system (the Army wants to start production); the threat of another manpower cut; and the volume of buying combat vehicles, small arms, tactical missiles, communications gear, and other equipment for modernizing combat forces. (The Zeus decision will now be held off until next April, pending a broad-gaged scientific review of the controversial project).

- **For the Navy,** the threat of another cut in the plans for procurement of fighter planes and anti-Aircraft missiles and construction of surface vessels; the possibility of a personnel reduction; and the rate of expanding the Polaris submarine-missile program.

Forced strike settlements...

The Taft-Hartley Law isn't good enough to settle national emergency strikes. Practically all hands agree on this as a result of the record on steel. But what to do about it?

The subject will be hot when Congress comes back in January. As things look now, when the 80 days run out, the steel strike will be on again, with the government's hand completely played out as far as legal authority is concerned.

Here are some of the proposals:

- Secretary Mitchell would put Presidential fact-finding boards into a dispute early—long before a strike reaches the emergency stage. He would have the Board hold public hearings, but would have the Board make recommendations only if asked by both sides.

- Compulsory arbitration will be proposed if a strike resumes at the end of an injunction.

- Voluntary arbitration will be suggested as an extra T-H step, as a way to bring public pressure on negotiators to settle.

- Create a public board to hold public hearings on any price increase proposed by a basic industry. This is the pet project of Senator Joseph O'Mahoney (D, Wyoming) who would have this procedure whether or not the increase is based on a wage raise.

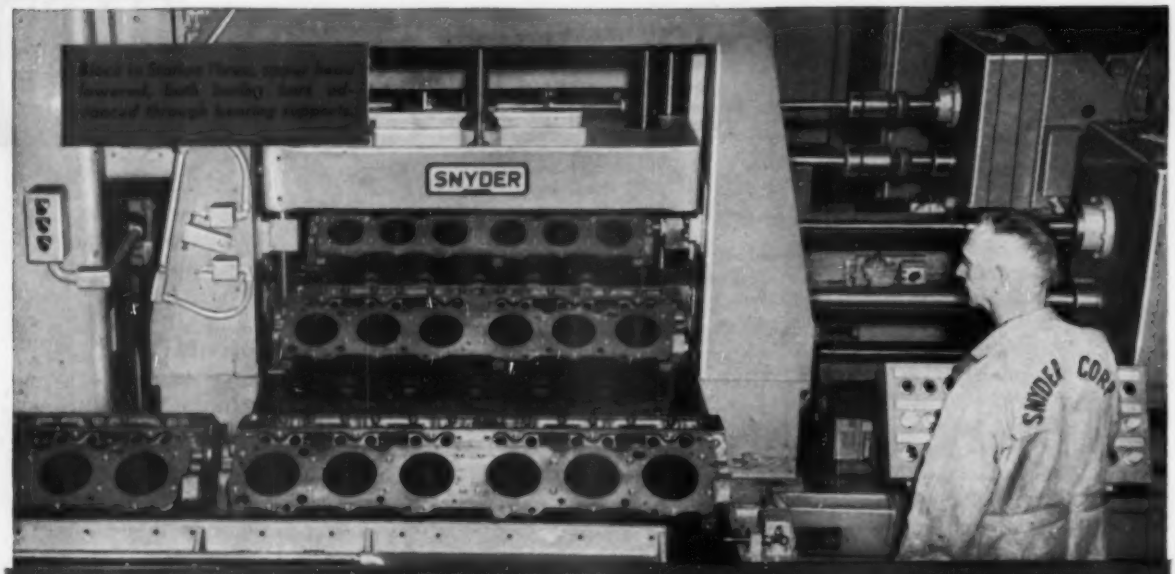
- Apply the anti-trust laws to unions—something which crops up regularly.

Loan fund orders...

The new policy requiring future loans to underdeveloped countries by the Development Loan Fund (to be spent in the US) eventually will mean some increase in orders for capital goods.

But the effects will be small and slow in coming. Only future loans, not those already approved, will be affected. The lag between approval of a loan and actual expenditure means orders won't be affected for 18 months to two years.

Roughly half of DLF's loans already are spent in the US, and some spending in third countries for equipment not available here would be permitted even under the new policy. Some purchases with tied DLF funds merely will displace normal US commercial exports. The total annual increase in orders probably won't exceed $100 million to $200 million, not all of it for capital equipment.



PRECISION BORING OF 42" LENGTH CAM AND CRANKSHAFT HOLES

SNYDERIZING Meets the Demand for Quality Parts for the Soaring Sixties

This 12-cylinder block is for heavy duty truck and marine engines aimed at taking a bigger bite of this booming market. Our Snyder special 7-station machine is helping this manufacturer SNYDERIZE for the Soaring Sixties by providing boring tolerances which make his product outstanding.

In regular production at a rate of 31 pieces per hour, main and camshaft bearing holes are rough and semi-finish bored simultaneously with all diameters held to manufacturers' specifications for alignment, roundness and concentricity. The distributor hole is also semi-finish bored in this machine to establish proper location to cam and crank bores.

Advanced engineering, both in product and production machines, is the best possible preparation for the competition of the next decade. We'll be happy to show you, too, how to SNYDERIZE for the Soaring Sixties to gain more efficient parts handling, gaging, assembly and machining. Write or phone for new brochure on machines for profit improvement.

Standard Features of Snyder Machines

1. SNYDER BEDS equipped with hardened and ground steel ways.
2. Rolling block principle throughout.
3. Automatic lubrication.
4. Walking beam transfer bar.
5. I.T.C. Standards throughout.
6. Electrical interlocks and full depth circuit throughout.
7. Panels equipped with SNYDER CIRCUIT SLEUTH.

SNYDER CORPORATION

(Formerly Snyder Tool & Engineering Company)

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Phone: LO 7-0123

DETROIT...

Detroit is hurting...

Layoffs are epidemic in the steel-short auto industry. As of October 23, GM had released 120,000 hourly workers. Only 10 of 13 Chevrolet assembly plants were operating, and these were to be closed by the end of the month as were most other GM plants.

Ford still expects to continue full production through mid-November, as does Chrysler and the independents. Chrysler is paying a premium to "import" steel from Texas, and Ford makes 50% of its own requirements.

GM, which gobbles up 100,000 tons a week when operating at capacity probably will not be able to get back into full production until the first of the year, even if the strike were to end immediately. The desperate company is now scrounging for slabs and ingots to take advantage of Great Lakes Steel Corp's offer to convert these directly into sheet—if and when the strike ends. This will cut days off the normal period required to produce steel from pig iron and scrap, but will at best sustain only partial production.

Sales but no cars...

It is tragic that the steel strike should hit hardest when sales, in some instances, were at an all-time high. Pontiac had its largest first 10-day period in history, delivering 18,354 units and writing orders for 17,133 more. In a two-day period, Chevrolet reported deliveries and orders for 75,000 cars, of which 35% were Corvairs.

Buick bragged of its best announcement since 1953 and Dodge the best since 1957. Rambler reported introductory sales 18% higher than last year, which was in itself an all-time record. This company, more cagey on steel stockpiling than most, has just added 1000 more persons to its hourly roles to keep up with production demands. Overall, the sales picture was, and we use the word advisedly, the best since 1955.

More new compacts...

The shape of cars to come, though cloaked in secrecy even tighter than that surrounding the Corvair, is slowly clarifying. A rebuilt order for the block line for the new B-O-P compact was placed in mid-October, proving our original reports of an aluminum V-8 to be correct.

The engine (or engines) will run around 200 to 230 cu in. displacement, and it is known that prototypes of the larger variety have turned up 185 hp on laboratory dynamometers. Some say that Pontiac will build it, others Buick. Confirmation of the latter stems from strong rumors that Pontiac has made a last-minute shift to a car using the basic Corvair body, but elongated slightly and powered by a beefier "pancake" six mounted in the rear.

Pontiac is also understood to be fooling with a 60-degree V-4, but this is most probably nothing more than the pet project of the Division's dynamic, engineering-minded general manager, Semon Knudsen. In any case, the timing of the initial tooling orders for B-O-P's car indicate a late fall introduction at the earliest.

Dodge, too, is jumping into the popular act, along with Mercury (AM, October 19) and possibly Pontiac, of stretching existing compact models. It plans a 1961 version, as yet unnamed, of the Valiant on about a 112-in. wheelbase. This may be powered by an aluminum engine, otherwise identical to the inclined six now used in Valiants, Plymouths, Darts and Dodges.

All of these additions to the compact ranks will be relatively luxurious. Prices will vary, some falling within the narrow spread between existing compacts and the "low-priced" field, whereas Buick's model may be placed just under that company's $2500 base figure. According to the most recent industry surveys, price is less of a factor than fuel economy.

Lifetime car?...

No, that millenium will probably never be reached, but one Big Three maker of medium and high-priced cars has a target date of 1962 to come up with one that has a life expectancy of, say, 200,000 miles without much maintenance.

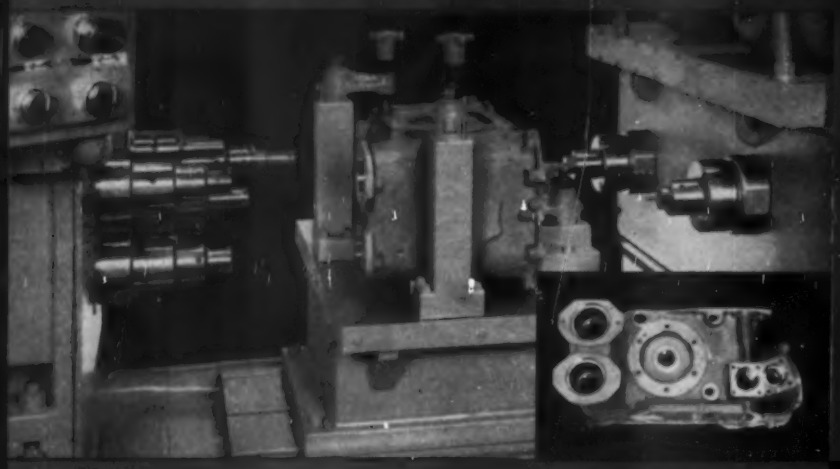
One essential in the program is a sealed cooling system to preclude the rust that finds its way into even the best-cared-for conventional plumbing. Another is transistorized ignition, already proved in research to have extended spark plug life almost indefinitely.

This maker is looking for an engine oil that will last the season without change, even under severe operating conditions, and it hopes that the rubber companies will pop with a timely 100,000-mile tire. There will be no grease fittings and both the differential and transmission will be sealed. To further reduce wearing parts, a central hydraulic system is planned.

Polyfuel diesels...

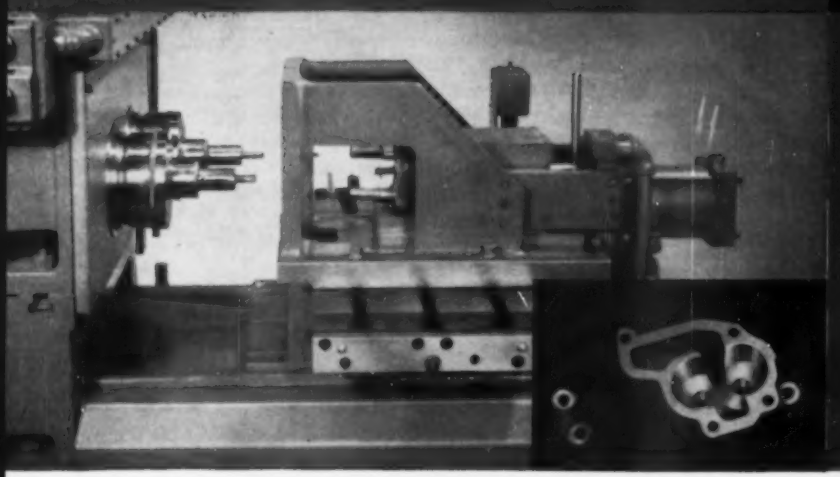
Hercules Motors Corp will shortly announce a new line of automotive diesel engines that will happily operate on almost any hydrocarbon fuel short of tar. The secret is a combustion chamber insert, made of a high cobalt alloy steel, that absorbs the heat generated from igniting highly volatile fuels (such as avgas) by compression alone.

Standard Ex-Cell-O Precision Boring Machines



. . . FOR FASTER MULTIPLE-HOLE WORK

Standard style 17-A performs 26 operations in one cycle on a magnesium aircraft casting. Machine bores five bronze bushings, counterbores seven aluminum faces four surfaces and chamfers eight shoulders with five spindles at left, two spindles at right.



. . . FOR FASTER CLOSE-TOLERANCE WORK

Style 112-D finish-bores gear pockets and shaft holes, and plunge-faces pocket bottoms of oil pump bodies to tolerance of plus or minus .0005". Flat faces are square to the bores and parallel to each other within working limits of .001".

59-17

10 REASONS WHY EX-CELL-O PRECISION BORING MACHINES DO MORE, AT LESS COST!

1. **RUGGED**—Heavily-ribbed base castings, chatter-free hydraulic-actuated table movement, isolated power assembly.

2. **FLEXIBLE**—Bridges easily spaced-out for large work, moved in for smaller parts.

3. **VERSATILE**—Inbuilt versatility, plus Universal Fixtures for toolroom work, short-run and production jobs. Spindles mount in any position.

4. **FAST**—Rapid table traverse, positive spindle brakes and quick-load fixtures for high output.

5. **LOW TOOLING COST**—Standard machine components, tools and accessories cut lead time, speed setup.

6. **AUTOMATIC LUBRICATION**—Separate lubricating system pumps oil directly to the ways.

7. **SEALED SPINDLES**—Ex-Cell-O Precision Spindles permanently lubricated during assembly.

8. **CONVENIENT CONTROLS**—Easy to use hydraulic controls contained in a single panel.

9. **TROUBLE-FREE**—Vital machine parts and controls protected from dirt, chips, coolant. Ready access to components for inspection.

10. **CAMS FOR CONTOURING**—Cam-operated boring machines available for precision contouring work.

Call your local Ex-Cell-O Representative, or write direct for complete details on the full line of Ex-Cell-O Precision Boring Machines.

EX-CELL-O FOR PRECISION XLO

EX-CELL-O CORPORATION *Machinery Division*
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • THREAD AND GROOVE GAGES • GRANITE SURFACE PLATES • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

AIRCRAFT and MISSILES... TRENDS

Greater defense per dollar...

"We would be utter fools or criminally dishonest if we did not recognize and admit that another war may break out any time," Lieut Gen John W Hinrichs, Army Chief of Ordnance, told West Coast defense contractors in a mid-October meeting of the American Ordnance Association.

General Hinrichs laid blame for bogging down of the nation's defense effort squarely to increasing costs of weapons and equipment. Costs are rising partially from inflation, partially from the increasing complexity of modern weapons, he said, adding that the Army's $9.5-billion share of the $40-billion U S budget just doesn't stretch far enough, even with careful spending, to provide all the quantities and types of weapons this nation needs "in these days of sudden, diverse and worldwide military threats."

Although he doubts a nuclear holocaust is likely, General Hinrichs does believe we will have to use the weapons at hand to fight limited wars. Because of this, the Army is spending about three times what it did last year in the procurement of conventional (non-missile, non-atomic) weapons. There are about $13 billion worth of Ordnance Corps procurement contracts now outstanding—about half of them with small business firms.

What the U S needs, General Hinrichs said, is a stepup in R & D programs and a shortening of production lead time so that "when a war comes we can immediately finalize our designs on certain items and get mass production on them as quickly as possible."

Some other considerations which must govern the activities of those who supply the Army:

- **Quality** . . . "There have been times in the past when the Ordnance Corps liked quality for quality's own sweet sake—in other words, where the Corps insisted on some quality aspect that had nothing to do with the item's performance. "But today things are improving and Ordnance is making progress in eliminating unnecessary quality requirements. But there will always be a lot of essential quality requirements still remaining, even in standard, conventional items we have been procuring for a long time."

Our new weapons, he added, are so complex and sophisticated that "some of these quality requirements may not make much sense to you . . . but until we gain more experience with them, please give us the quality we ask for."

If a defense contractor thinks a requirement is too high, he is urged to try through proper channels to get the specs changed. "If you can't get action that way, write to me about it," he said, "I won't promise to buy it, but I will promise thorough investigation."

- **Time** . . . "We in Ordnance must perfect our scheduling, dovetail out delivery requirements, make sure that 15 or 20 areas of a single weapons system fit together timewise, and establish practical, realistic delivery schedules for you and me. And then you've got to meet them, or else the whole damn project breaks down, and other installations stand idle waiting for material."

Around the industry...

- Pre-packaged liquid-propellant rocket engines (for the Navy's Sparrow III and Bullpup missiles) are in production at Thiokol's Reaction Motors Division, Bristol, Pa. The pre-packaged engine can be stored for long periods, withstand rough handling, can go into operation immediately. Most of the engine is aluminum, turned or bored from forgings. Assembly involves Heliarc welding with 100% penetration. Coming: a similar, much bigger engine.

- Siegler Corp's Hufford Division has just completed a new metallurgical lab for analysis of space age metals. Purpose: to evaluate use of exotic metals in such items as pressure vessels and rocket motor cases—and to further develop application of the Hufford Spin Forge Process to manufacture of missile hardware.

- North American Aviation has taken over Phillips Petroleum's interest in Astrodyne Inc, makers of high-thrust, liquid-propellant rocket engines (Atlas, Thor, Jupiter), now owns it wholly.

- Alexander De Seversky has just defended manned aircraft (such as the B-70 bomber) as "America's best defense weapon for perhaps the next decade." The United States needs, he said, "Man's brains and the function of choice to make dependable penetrations of today's sophisticated defenses. Nothing is more sophisticated than man."

- A crew of trained soldiers, no engineers or scientists among them, drove the Army's new Sergeant missile onto Aberdeen Proving Grounds, set it up ready to fire in just 10 minutes in a recent demonstration before Army brass.

- First twin-engined, gas-turbine-powered helicopters to go into scheduled passenger service have just been bought (five of them) by Los Angeles Airways from Sikorsky Aircraft.

New life for old lathes with:

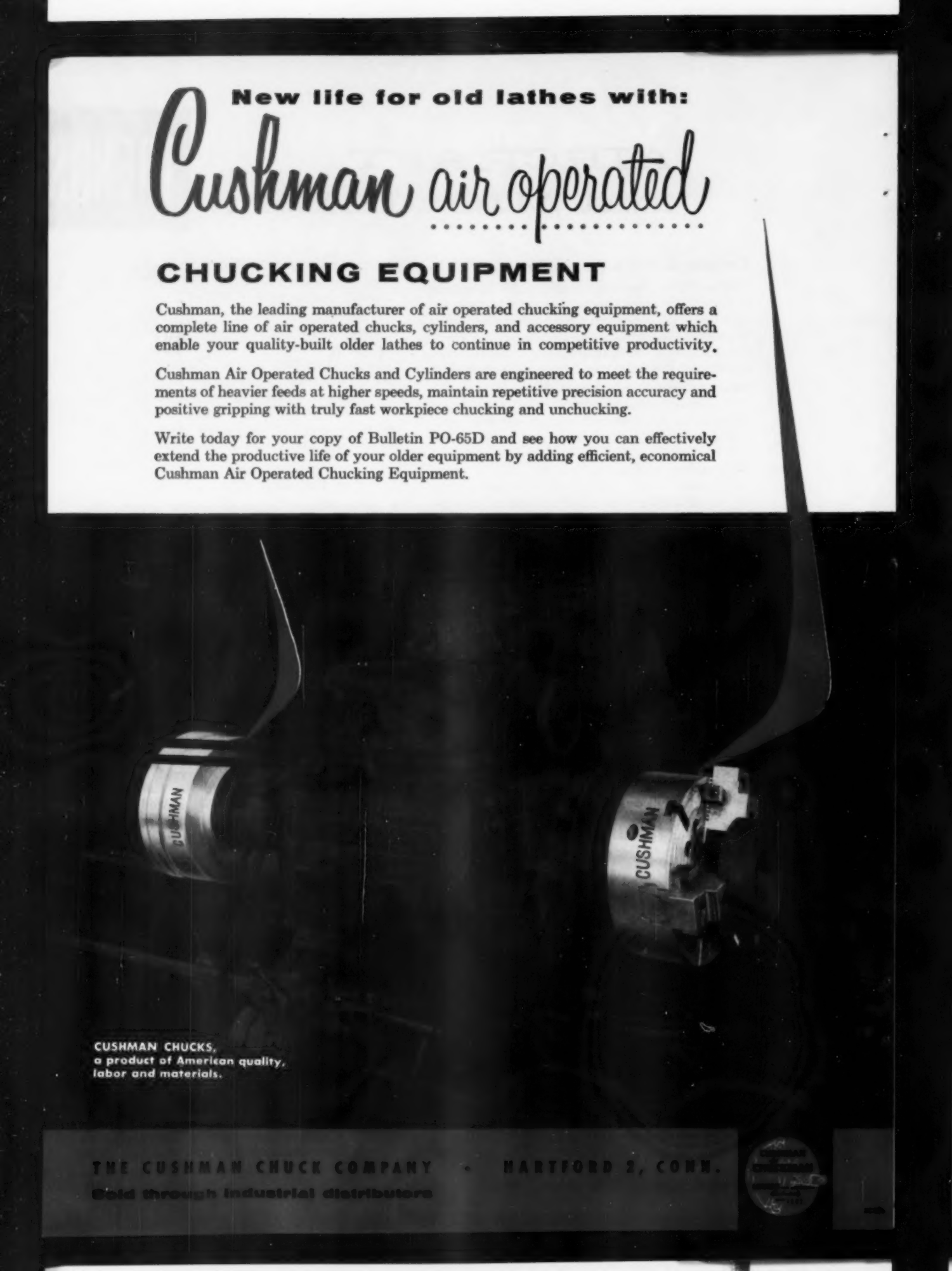
Cushman air operated

CHUCKING EQUIPMENT

Cushman, the leading manufacturer of air operated chucking equipment, offers a complete line of air operated chucks, cylinders, and accessory equipment which enable your quality-built older lathes to continue in competitive productivity.

Cushman Air Operated Chucks and Cylinders are engineered to meet the requirements of heavier feeds at higher speeds, maintain repetitive precision accuracy and positive gripping with truly fast workpiece chucking and unchucking.

Write today for your copy of Bulletin PO-65D and see how you can effectively extend the productive life of your older equipment by adding efficient, economical Cushman Air Operated Chucking Equipment.



CUSHMAN CHUCKS,
a product of American quality,
labor and materials.

THE CUSHMAN CHUCK COMPANY · HARTFORD 2, CONN.
Sold through industrial distributors

MACHINE TOOLS...

Machine tool orders move up...

Net new orders for cutting-type machine tools rose about $7 million in September to almost $49 million for the month. Orders for forming-type machine tools also turned up to $10.7 million. Thus new business in September totaled just under $60 million.

That made September the second best month of '59. There is a good chance that net new orders for the year will be $675 million for both cutting-type and forming-type machine tools.

Machine tool shipments are moving up too. In cutting-type machines, they were $36.4 million during September, and in forming-type machines $9.3 million.

With orders outstripping shipments, the industry's backlog is going up and now is, on the average, about five months.

Russians swap machines with West...

The Russians are believed to be getting more machine tools from western Europe than Americans would like to think. Most of the machines are going to Moscow from German and Italian builders, but the British and Swiss also are participating.

Recently Stankoimport, which is the Moscow agency buying as well as selling machine tools, has told the Swiss that machine tool orders cannot be just in one direction—from West to East. If the Swiss expect to supply machines to the Soviets, they must agree to take a certain number of Russian machine tools in return.

Though this barter-type of deal is distasteful to the Swiss, reliable reports say that at least a few Swiss builders have gone through with such an arrangement.

An Italian firm is said to have an order from Moscow to furnish machines for a complete bearing production line. This firm would like to get a large number of grinders from a U S builder, apparently for this line. Inquiries already have been made here, but chances are slim. For one thing, Washington probably would deny export licenses for the desired grinders.

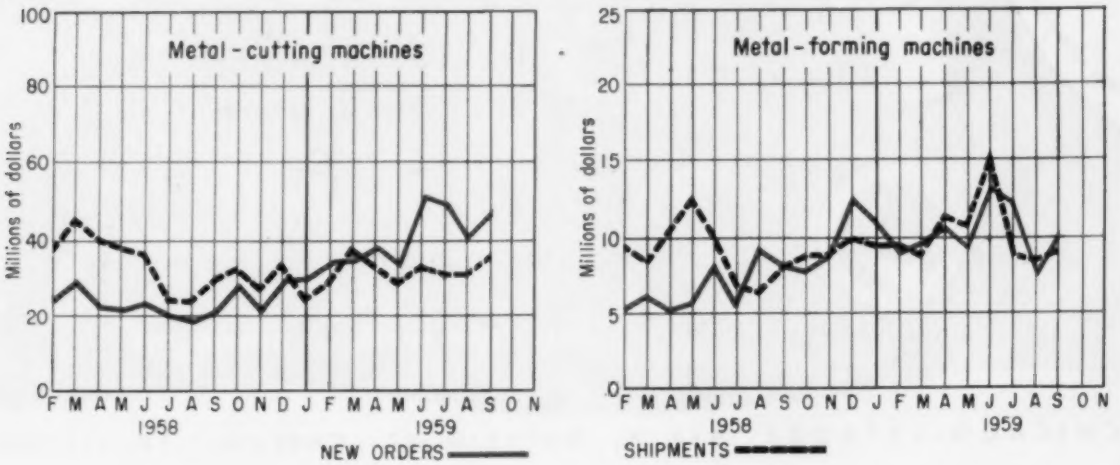
Germans consider building block . . .

West German mass production industries are pressing German machine tool builders to agree to a set of standards conforming to the building-block concept. The German Association of Engineers (VDI) accordingly has established a special committee that has drawn up a proposed set of standards. It is believed that VDI used some data from Ford in working out its proposals.

The German standards have not yet been accepted. They will be brought before the International Standardization Organization with the purpose of getting world-wide agreement. All the dimensions are in millimeters and do not correspond exactly to proposed U S standards. **German proposed standards cover four sizes** of center and wing sections with corresponding dimensions for heads, ways, mounting hole centers, and carriages. All bases are of the same height above the floor (22.8 in.), but differ in length and width.

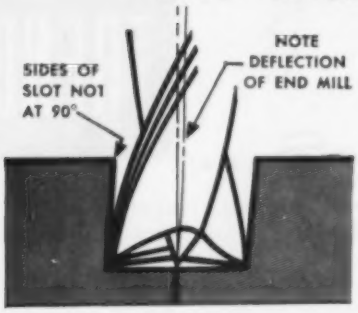
B.F.

NMTBA Index of machine tool new orders and shipments



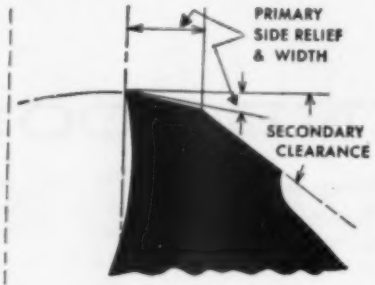
◄ CIRCLE 227 READER SERVICE CARD

END MILL TIPS YOU CAN USE



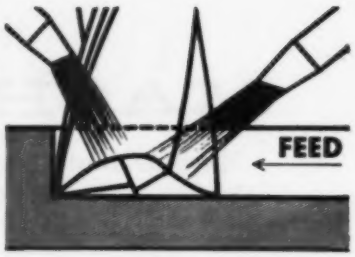
"WOBBLE"... ITS CAUSE AND CURE

Non-perpendicular sides of a slot can be caused by a worn spindle, excessive flute length, or too slow spindle speed. This "wobble" slot is actually a deflection of the end mill caused by one flute hogging into the cut. If the proper end mill with shortest necessary flute length is being used, eliminate spindle runout and increase its speed.



END MILL RESHARPENING

Always consider the material to be cut, and grind to limits recommended by the tool manufacturer. It is best to resharpen end mills to produce just enough primary relief to eliminate drag. Too much relief causes chatter . . . brings on rapid dulling of cutting edges. Secondary relief depends on the size of the end mill, the width of the primary relief, and the feeds being used.



ABOUT CUTTING FLUIDS

End mills require cutting fluids to protect the tool, control temperatures, and provide lubrication. Multiple streams generally provide more cooling effect than a slow moving heavy flow. Remember that present day jet cooling methods do not provide sufficient cooling because of greater tooth-to-work contact in end milling as opposed to turning operations.

FOR QUICK SOLUTIONS TO **ALL** YOUR DRILLING-REAMING-END MILLING PROBLEMS, SEE CHICAGO-LATROBE CATALOG No. 58, OR CONSULT A C-L SERVICE ENGINEER

BEST TIP OF ALL . . .

CHICAGO-LATROBE 416 W. ONTARIO ST., CHICAGO 10, ILLINOIS

TRENDS

MATERIALS...

Tin improves cast iron...

For many years, tin in cast iron was generally believed to be a subversive element causing brittleness in grey irons and adversely affecting the graphite structure in nodular irons. Then, in 1952, M Morrogh reported extensive experiments on the influence of certain residual elements in magnesium-treated nodular iron which indicated that tin might be a valuable additive. Amounts up to, at least, 0.13% of tin did not harm the formation of graphite nodules and the tin was an active and potent promoter of pearlite. Others, including A DeSy and J Foulon, performed additional experiments. These men reported a completely pearlitic matrix at 0.03% tin, with no evidence of free cementite at residual tin contents of 0.10% and higher.

Ultimate tensile strength and indentation hardness rose steadily, while elongation fell from about 8% to about 3% with up to 0.03% of tin. Observations by DeSy and Foulon on lamellar-graphite irons showed that the matrix was wholly pearlitic when the tin content was 0.048%. Because of these observations, the Tin Research Institute asked Battelle Memorial Institute to conduct a comprehensive study.

Production of an automotive or high-strength grey iron was the primary goal of these investigations; an iron that would give high wear resistance. A second goal was to develop, by simple means, a tough nodular iron having a completely pearlitic matrix.

Adding tin in small amounts may achieve the desired results, according to data obtained with several different types of cast iron. For one thing, the matrix is wholly pearlitic at a tin-content level that does not significantly impair impact strength. Moreover, small excesses of tin do not cause the massive cementite, that hinders machinability, to appear in the microstructure. Adding 0.1% tin to base iron increases tensile strength from 32,000 psi to 35,200 psi, increases Brinell hardness (step bar) from 187/179 to 187/207, and raises impact value from approximately 30 to 32.

A nodular iron originally containing 71% pearlite and 29% ferrite in its matrix showed approximately 97% pearlite and 3% ferrite after treatment with 0.05% tin. The ferrite-graphite "bullseye" is eliminated.

Possible applications include piston rings, cylinders, machine-tool components, crankshafts, and rolls. However, where only strength and hardness are desired other additives may do the job at a lower cost than tin. A further possible value of tin in cast iron is as a dimensional stabilizer.

Controlled-pressure pouring...

Patented by Griffin Wheel Co, a subsidiary of American Steel Foundries, a relatively new method of pouring steel is expected to have wider application than originally expected. Now used in five of the developer's plants to cast steel freightcar wheels, the process is called controlled-pressure pouring.

Steel is melted in an electric furnace and poured into a large ladle. A crane places a graphite mold atop the ladle and the molten metal is forced upward into the mold by air pressure. Then the mold is lifted off and another is put in its place. After slight cooling, the mold containing the casting is placed in an annealing furnace. After removal from the mold, simply machining the center hole completes the wheel. No machining is required on the tread or other external surfaces.

United States Steel Corp, under an agreement with American Steel Foundries, will study how the process can be used to produce semi-finished steel mill products.

Steel-hard, aluminum-light...

"Sitall," a glass-microcistal material compounded under heat and pressure, is harder than alloy steel and lighter than aluminum—according to its Soviet inventors. The material is said to possess high mechanical, thermal and electrical properties.

Sitall readily accepts sudden changes in temperature, thermal shock. A large piece heated to 1000 C and thrown into cold water neither cracks nor warps. It will be used for anti-friction bearings, for all friction surfaces in chemical pumps, and for fireproof walls and pipes.

Net forgings...

Lockheed Aircraft Corp's Georgia Div is conducting a program to produce net or draftless forgings of magnesium alloy HM21. Sponsored by Air Material Command, the company will evaluate forgeability of the material and establish design-allowable mechanical property values. Plan is to produce a simple part and follow it with forgings progressively more complex.

Work done previously by Dow Chemical Co indicates two compositions, EK31, a rare-earth alloy, and HM21, a thorium-manganese alloy, to be the superior alloys of a group experimentally developed for possible applications to 700 F. EK31 showed superior properties to 550 F, and HM21 alloy extended possible applications to 700 F.

General Electric announces the new Adjust-O-Breaker toolholder!

Carboloy® toolholder with adjustable chipbreaker lets you adjust from any angle . . . offers any desired adjustment within its range* . . . features "floating" indexable chipbreaker with absolute repeatability.

MORE jobs with *LESS* tooling—that's what you get with this new Carboloy® Adjust-O-Breaker toolholder! No need to have a separate chipbreaker for every cutting job. No need to restrict yourself to toolholders with only two or three chipbreaker settings. Now you can have this versatile new Carboloy toolholder . . . and *adjust it for any chipbreaker setting within its range.**

Available right now from stock in 5 styles, negative rake, for left- and right-hand machining, the Adjust-O-Breaker truly brings new meaning to disposable tooling.

So, to get cutting tool versatility that lets you handle *more* jobs with *less* tooling, check into the complete Carboloy line—Lift-O-Matic (positive rake, negative rake, and tracer), heavy-duty, and the new Adjust-O-Breaker toolholder. The complete line of Carboloy inserts, insert seats, convertible seats, and brazed tooling is the *broadest* in the industry . . . designed to meet *every* tooling need to give you BETTER PROFITS THROUGH BETTER TOOLING.

See your Authorized Carboloy Distributor now. He's listed in the Yellow Pages. *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Road, Detroit 32, Michigan.*

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CARBOLOY® CEMENTED CARBIDES
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WHAT'S AHEAD... in Metalworking

TRENDS

Steel: who gets it and when?

Even with steelworkers back on the job it's going to take a long time to get steel supplies back to the point where they meet demand.

First, steel mills' blast furnaces and open hearths have to be rebricked, a job that takes weeks. Then the involved process of turning iron ore into finished products (sheet, plate, bars, etc) begins.

Upshot is that steel won't be on its way to producers for several weeks, and then there will be a mad scramble for it. Consensus is that top customers will get first crack at it (autos, appliances, other consumer goods producers), and this is no news to anybody.

One further complication: the big freeze is due on the Great Lakes along about now, keeping the ore boats from Mesabi tied up until spring.

Hardest hit by shortages are such mass-production industries as autos (see Detroit column, p79) appliances, farm equipment and the like.

The aircraft and missile industry, along with the closely associated electronics industry, on the other hand isn't too much affected by shortages.

While there's been a little trouble getting nonstandard items for particular jobs, most firms estimate they won't feel a real pinch before December or January. In other words, most companies in these industries feel they can ride out the 80-day Taft-Hartley injunction period.

At press time, warehouse inventories of steel were down to 1.8-million tons of steel (critical point is 2-million tons).

Warehouse shortages are all in flat-rolled products, especially in the Chicago-Detroit-Cleveland areas. There's a little left in the coastal areas, but it's fast disappearing.

Inventories in major inland manufacturing areas are very low on heavy plate, in slightly better shape in the rest of the country. Hot-rolled bars are especially short in the Midwest.

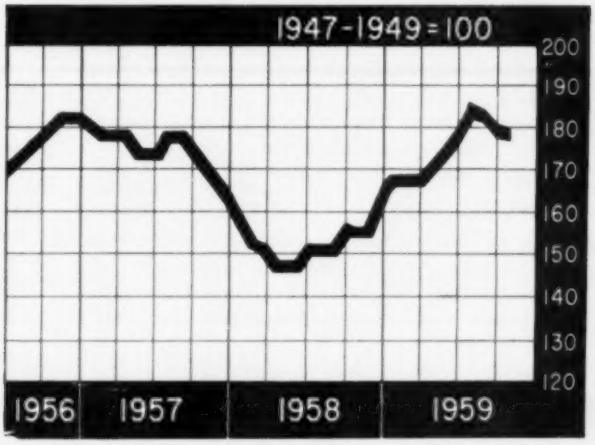
Tubing is in fairly good supply, and there are no warehouse shortages at all in stainless and tool steels.

Generally, the coastal areas are better off than inland metalworking centers for three reasons: 1) imported steel hits these areas first and much of it gets no farther, 2) much steel capacity is still operating on the coasts, and 3) consumption hasn't been as great as in inland areas.

But warehousers can no longer keep customers going. Supplies have dwindled to the point where allocation and delivery stretchouts are no longer possible. Larger consumers are finding that they may have 75% of the sizes and types of steel they need, but the other 25% is just not to be had.

Smaller companies, which depend to a great extent on warehouse supplies, are going to have to shut down soon, unless supplies come from somewhere. One bright spot: as soon as the strike ends, supplies now sitting tied up in 25 struck warehouses will be freed, but while this is a hefty chunk of tonnage, it won't last long.

One thing that is giving honest warehousers nightmares: some of their labeled steel is turning up on the black market. This especially galling to the warehouser after he has turned down a good customer's legitimate request.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**180**	**183**	**183**	**156**
Machinery	157	159	130	
Electrical Machinery	227	221	185	
Autos	131	133	66	
Other Transportation	346	350	374	
Other Metalworking	154	156	141	

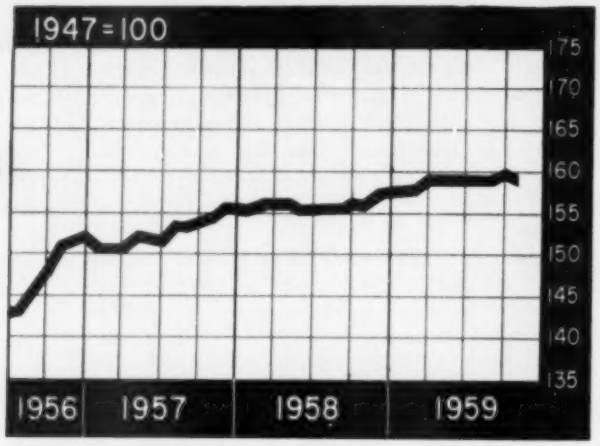
TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	OCT. Estimated	SEPT. Preliminary	AUG. Revised	SEPT. Year Ago
Total Index	**159.8**	**159.6**	**159.4**	**155.8**
Metalworking Machinery	...	**188.3**	**187.8**	**180.8**
Other Machinery exc. Electrical		**171.5**	**171.3**	**165.9**
Electrical Machinery	...	**162.2**	**162.2**	**158.8**
Fabricated Metal Products	.....	**148.6**	**148.5**	**133.1**

159.8



Booming business will greet the new year...

Resumption of normal steel production will touch off a new period of hectic business activity. Industrial production and GNP (the overall measure of final output), both cut by the steel strike, will bounce back to pre-strike highs. Business will thus boom in the early months of 1960.

Another round of inventory building is a sure bet. Business inventories grew at near-record rates during the first half of 1959. Since the beginning of the steel strike, however, inventory levels have been declining. Stocks of steel and many finished products—including cars—have been drawn down. Inventory levels will have to rise to meet the increased sales volumes in prospect for the months ahead. And sales of both consumer goods and capital equipment will rise.

Personal income will be rising. Total personal income fell from the July peak as a result of the steel strike. Nevertheless, personal income for the first nine months of the year hit an annual rate $22 billion higher than the 1958 rate. Steel workers and other factory workers will be earning overtime wages in the months ahead, and there will be further drops in unemployment. So the personal income level will be rising. And rising personal incomes will boost consumer spending.

Business spending also will increase. Some of the outlays for new plant and equipment planned for late 1959 have been postponed because of the prolonged steel strike. Total capital spending for the year will thus fall short of $33 billion.

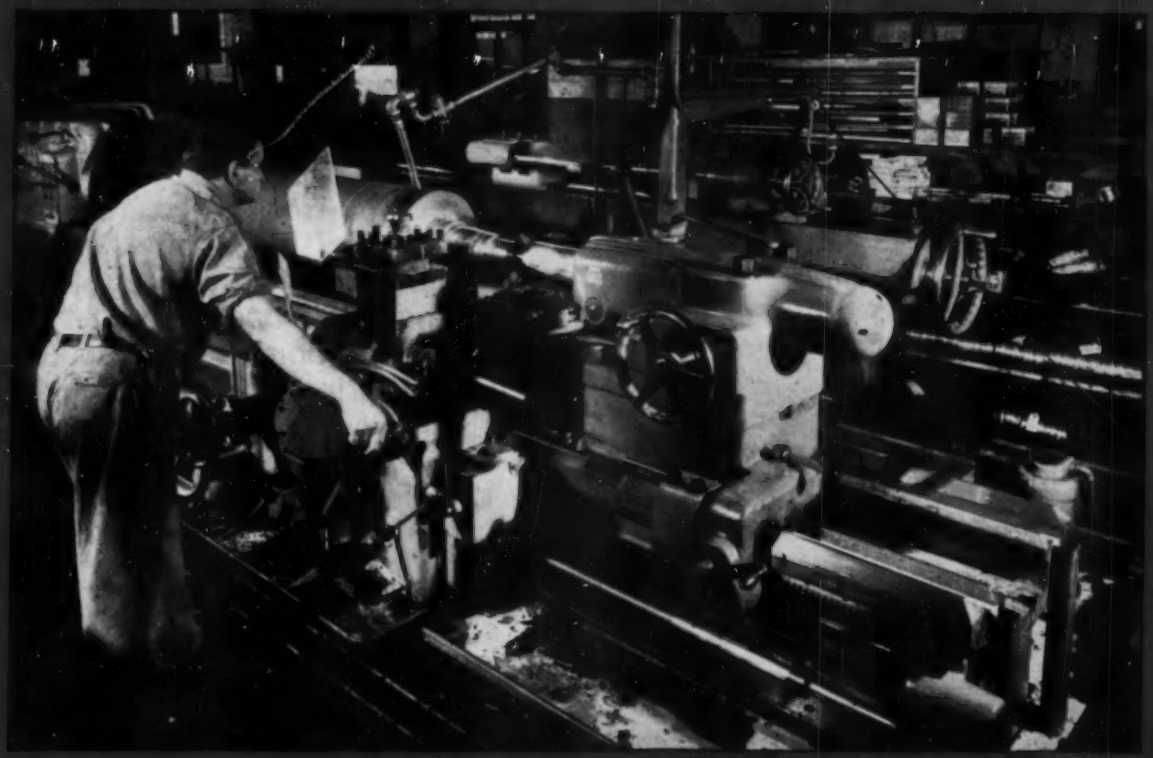
There is, however, a real need for additions to capacity in many industries. After more than two months of the steel strike, the index of industrial production had dropped only 7 points from the record 155 reached in June. There is thus concrete evidence that this year's boom is resting on solid ground, and new plant will be needed to keep abreast of business growth. 1960 is sure to open with a bang.

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	143.5	144.0	136.0
Steel ingot production (thousand tons)	371	368	2,026
Electric power output (million Kilowatt hours)	12,861	13,086	12,048
Production of automobiles and trucks	135,312	118,793	45,387
Engineering construction awards (Eng. News-Record, millions)	$260.9	$264.3	$254.3

MONTHLY BUSINESS INDICATORS	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	314	378	247
Vacuum cleaners sales (thousands of units)	268	221	280
Washers sales (thousands of units)	359	318	327
Household electric ranges sales (thousands of units)	61	67	48
Radio production (thousands of units)	1,009	829	1,029
Television production (thousands of units)	547	350	507
Gear sales index (1947-49=100)	N.A.	262.8	162.1
Foundry equipment new orders index (shipments, 1947-49=100)	134.1	110.7	74.1

* Seasonally adjusted

FROM 12½ HOURS... TO 4½ HOURS... plus BETTER FINISH



Bulletin No. 135 gives a complete description and shows many examples. It's yours for the asking.

R. Hoe & Co. Inc., New York world renowned manufacturers of printing presses, has actually accomplished this in the machining of their impression cylinders.

Using a 32" "AMERICAN" Hydraulic Tracing Lathe, the cylinder journal shapes are generated from a template and the 15" diameter cylinder body is turned straight without the template control.

The all-hydraulic tracing unit in combination with the accuracy and rigidity inherent in "AMERICAN" lathes insures the highest quality of work both from the standpoint of accuracy and fine finish.

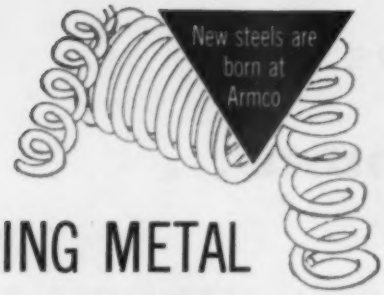
With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to spiraling costs—modern, high production machinery is the answer to greater production per man hour.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

CIRCLE 230 READER SERVICE CARD



HERE'S A SPRING METAL THAT COMBINES

- **Excellent Elastic Properties**
- **Strength at High Temperatures**
- **Good Workability**
- **Resistance to Corrosion**

Armco 17-7 PH Stainless Steel specified for wide variety of springs that operate under severe conditions; replaces more costly spring materials.

Unusual combination of properties possessed by Armco's special precipitation-hardening stainless steel, 17-7 PH, has made it a popular material for springs that must resist heat or corrosion.

Armco 17-7 PH Stainless Steel—

- has ultimate tensile strength up to 350,000 psi (wire in Cond. CH900); elastic limit of the order of 75% of the ultimate tensile strength; torsional modulus of 11,000,000 psi.
- resists corrosion like Type 302 stainless steel.
- retains valuable elastic properties at temperatures as high as 650-700 F.
- has good fabricating characteristics, low temperature heat treatment after forming.
- is available in wide range of sizes of bars and wire, in variety of conditions; also produced in sheets and strip.

Consider how these advantages of Armco 17-7 PH Stainless can be used to improve performance or cut costs of springs in *your* products. Write for complete design and fabricating data on this unique spring material. Armco Steel Corporation, 2889 Curtis Street, Middletown, Ohio.

ARMCO STEEL

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation

American Machinist

THE MAGAZINE OF METALWORKING MANUFACTURING • ESTABLISHED 1877

What Can It Do For You?

Value engineering is just beginning to come into its own. In the months ahead you will hear much more about it.

If the term mystifies you, think of it as value analysis. That is the better known name for it.

Value analysis got its start at General Electric twelve years ago. GE's program was described in detail for the first time anywhere in AMERICAN MACHINIST ten years ago.

What value analysis does . . .

is to test every component part or material going into a product to find out whether it meets the requirement of the lowest possible cost with maximum quality. It involves a decision to make it in the shop or buy it outside, with cost the dominant factor.

Such questions about the part or material must be answered satisfactorily as: Is its cost proportionate to its usefulness? Is there anything better available? Can a usable part be made by some other method at lower cost? Is the part made with proper tooling, in view of the quantities asked for?

GE engineers, who participate in value analysis, are told to design a product comprised of materials and components that include the latest advances in low-cost production techniques. The purchasing department is instructed to search for low-cost suppliers meeting the needs of manufacturing.

General Electric has setup . . .

These teams consist of company-trained value specialists and key men from manufacturing, engineering and finance. They know production planning and engineering. Their value analysis work puts them in touch with all phases of product development and manufacturing.

A sample project: General Electric has originated an electric motor, not yet on the market, that is reliable, of good quality and up to company standards. Market research uncovers a need for it among customers. But costs of materials and of production are so high that it is impossible to meet the selling prices expected from strong competition. The problem for value analysis is to come up with recommendations that will reduce the cost of manufacture 30 percent without reducing the motor's quality or reliability.

Several practical examples of the results of value analysis show why General Electric has found its program to be highly successful. A J-bolt that used to be made on a screw machine for 11½ cents is now produced by roll-threading for 1½ cents. A stamped hinge costing 37 cents was discarded in favor of a roll-formed hinge costing 27 cents. An impeller casting that used to be milled after being cast is now formed from powdered iron, thus cutting the cost from 40 cents to 10 cents.

Value analysis acts as a monitor . . .

of all General Electric's product manufacturing activities. In the words of L D Miles, who has headed the program from the beginning, it "represents an important concept in modern industrial management." And back of it all is the over-riding consideration of cost reduction, accomplished by company-wide team work in manufacturing, engineering and purchasing.

Whether you call it value analysis or value engineering, the benefits are the same. Its application is not confined to mammoth companies like General Electric. More and more small metalworking companies are adopting the technique. Every material, every part, every operation in making the final product is subject to value engineering.

Why don't you look into what it could do for you?

Burnham Finney EDITOR

Here, a slip joint collar is being turned and bored from a T-6 aluminum blank. Floor-to-floor time is only 25 minutes, a 30% saving in time alone.

even an engine lathe can have an impressive record of savings if it's a LODGE & SHIPLEY POWERTURN

records show $2000.00 annual saving . . . 30% on a typical operation

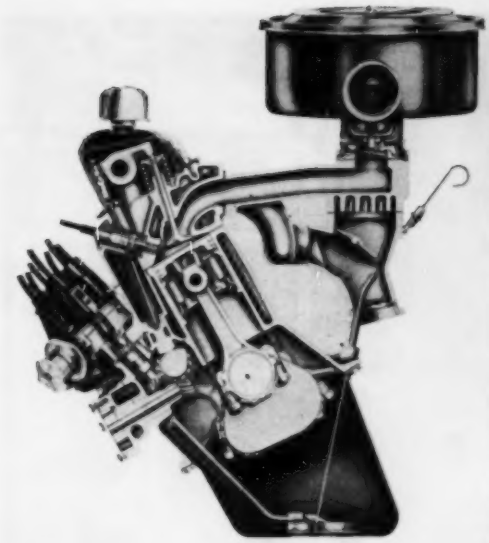
Significant savings are nothing new on production type lathes but it is something to write home about on an engine lathe. Tacoma Boatbuilding Co., Inc., Tacoma, Washington, liked the accuracy, versatility and output of their POWERTURN Lathe . . . found impressive savings even when this engine lathe was used for non-repetitive operations.

Whatever your turning requirements, consider Lodge & Shipley. Your needs can be filled precisely from a complete range of sizes and types . . . Production, Engine, Toolmaker, Gap, Hydraulic Tracer Controlled and Right Angle Chucking Lathes . . . all designed to provide the best machine for a specific job.

Check Sweet's Machine Tool File, your telephone book Yellow Pages or write direct for literature: **The Lodge & Shipley Company, 3056 Colerain Ave., Cincinnati 25, Ohio.**

Your Lodge-ical choice . . .

Lodge & Shipley



Dovetailing of product design with manufacturing practicality has paid huge dividends in production of Valiant 6-cylinder engines, which, with minor retooling, are produced as engines for the Dodge Dart and the lowest-priced Plymouth. Innovations such as the turning of main bearing diameters on camshafts in chucking machines (above) have saved Chrysler time and money in the race to get out the U S compact cars

Interchangeable parts, flexbility and automation go into...

Tooling Valiant's versatile engine

By George De Groat,
Detroit editor

Flexibility of product design and flexibility of manufacturing methods go hand in hand in Chrysler's new compact car program. And this integrated design-manufacturing concept has already paid handsome dividends:

First, the basic Valiant 6-cylinder engine also serves Chrysler's new Dodge Dart and the lowest-priced Plymouth line.

Second, designing the product and the process together has meant that every design feature of the engine has been pre-checked out for manufacturing practicality and costs have been cut to the bone.

For example, the water pump housing has been made an integral part of the block, eliminating the need for a separate casting. This one move not only holds costs per piece to a minimum, but has cut tooling costs to about one-half-of-one-percent of that of the old method.

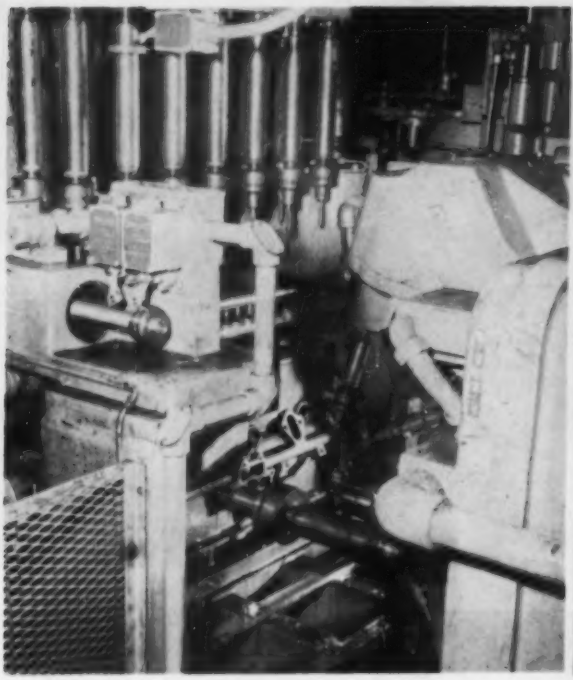
This same concentration on simplicity of manufacture has resulted in Chrysler's consolidation of six engine building plants into two. Among other advantages, this has released a large number of relatively new machines for conversion of V-8 production to manufacture of the new Valiant 6-cylinder engines.

These engines, while specifically designed for the Valiant, can with relatively minor changes in manufacturing equipment be upped in horsepower to serve as powerplants for the Dodge Dart and the Plymouth. As a powerplant for the Valiant, the 100-hp engine has a displacement of 170 cu in. With the same bore, but with a 1-inch greater stroke, the Valiant engine can provide 225-cu-in. displacement as a Dart or Plymouth 145-hp engine.

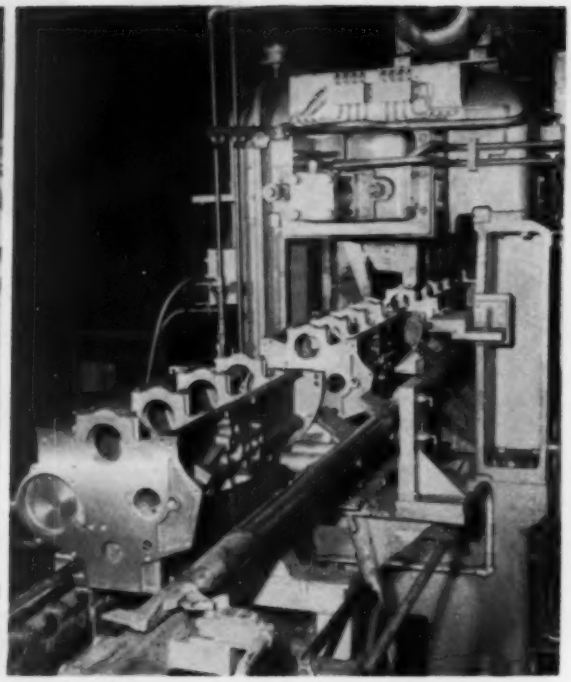
Engine parts in all three applications are identical, except for connecting rods, block and crankshaft.

Because all major parts are common, production volume is far above what it would be for the Valiant

Tooling Valiant's versatile engine . . .



Engine blocks tapped at angle . . .
Compound heads in this machine do the first angled tapping applied in the automotive industry. This is the last of four similar Buhr machines. First station taps top and end holes, the second produces the angled holes, and the third taps bottom holes after the block has been turned over. All drilling is segregated into the three previous machines



Power-and-free conveyors . . .
Centri-Spray conveyor transfers engine blocks between Ingersoll drilling machines while both are in cycle; blocks arrive at the second machine before the first completes its cycle. Empty fixtures never run through the machines because the conveyor stores large banks of parts between machines—larger than fixed-stroke transfer bars can allow

alone. Consequently, unit cost per piece is way down.

Six production lines (one for blocks, two for heads, one for connecting rods, one for crankshafts and one for camshafts) are capable of turning out 500,000 Valiant-Dart-Plymouth engines a year on a straight time basis at Chrysler's Mound Road (Detroit) and Trenton, Mich, plants. With only a little more capital expansion, output can be increased significantly.

Built-into-the-product manufacturing advantages have paid off in production of engine blocks. This cast iron part is produced by sand casting, but its design is such that it can be made by die-casting if Chrysler goes to an aluminum engine.

Prospect of an aluminum engine has encouraged wider use of sub-land tools on nearly all machining lines, with the result that multiple-diameter holes are produced at considerably lower unit cost than can be done with conventional tools.

Admittedly, initial tool costs are somewhat higher for sub-land tools, but tool life is better, and much has been gained by combining machining operations to eliminate extra stations. Thousands of dollars are saved by the elimination of a single station, with its slides, base, columns, electrical and hydraulic controls, and the like.

All Valiant machining lines have been built (or rebuilt) to achieve maximum flexibility of speeds and feeds. Every machine is equipped with quick-change gear boxes in case engine materials are changed, or cutting tools are improved.

It cost little extra, for example, to equip heads with quick-change gears, yet these heads can one day effect major savings if higher speeds and feeds become necessary. For instance, if each spindle on a multiple-spindle drilling machine costs $300, it would cost $6000 to replace 20 spindles with ones of greater speed if materials were to be changed.

For this same basic reason, heads on the block line are equipped with adjustable quill spindles so as to simplify relocation of holes in the event of a change in block design. Too, the block line is so designed as to minimize changeover time in switching from blocks for the Valiant to blocks for the Dart and Plymouth. In fact, the entire engine line is laid out to accommodate production expansion if sales warrant.

Another innovation designed into the Valiant engine lines is the use of power and free roller conveyors, instead of fixed indexing mechanisms, for transferring blocks between machines in the line. In this way, more blocks can accumulate in a smaller space than can be banked when transfer-bar stroke distances have to be considered. As a result more pieces are available to keep a machine running if the machine preceding it is down for tool change.

Chrysler has gone in for what it calls "selective automation" on its Valiant engine lines. In other words, some operations are highly automated, others not at all. For example, connecting rod bearing caps are installed manually with nut runners—not with complex bearing cap assembly machines. Reason for this is that studies showed cost of setting up the manual operation to be less

than 6% of the cost of an automated machine—and indirect labor costs are significantly lower, too.

To take another instance: manual gages for checking cylinder bores cost only 5% as much as automatic ones, are more versatile (varying production quantities can be run through them without the need for buying a new machine when quantities increase, or letting a machine stand idle when quantities are reduced), and they are not subject to expensive down time.

On the other hand, the Valiant piston line is one of the most automated in the auto industry. This line, made up entirely of rebuilt equipment, includes individual machines with automatic loaders and unloaders, and with simple automatic handling devices between them.

Less locating, clamping

As in other automated Valiant lines, the basic philosophy is to locate and clamp a part as few times as possible. This cuts down on the inherent inaccuracy arising from frequent releasing, relocating and reclamping of the piece.

On the Valiant line the piston is completely turned in a Baird multiple-spindle chucker with automatic loading and unloading. The piston has been specifically designed for this unique procedure, is held on the ID by a pin chuck. All dimensions are established from this single setup.

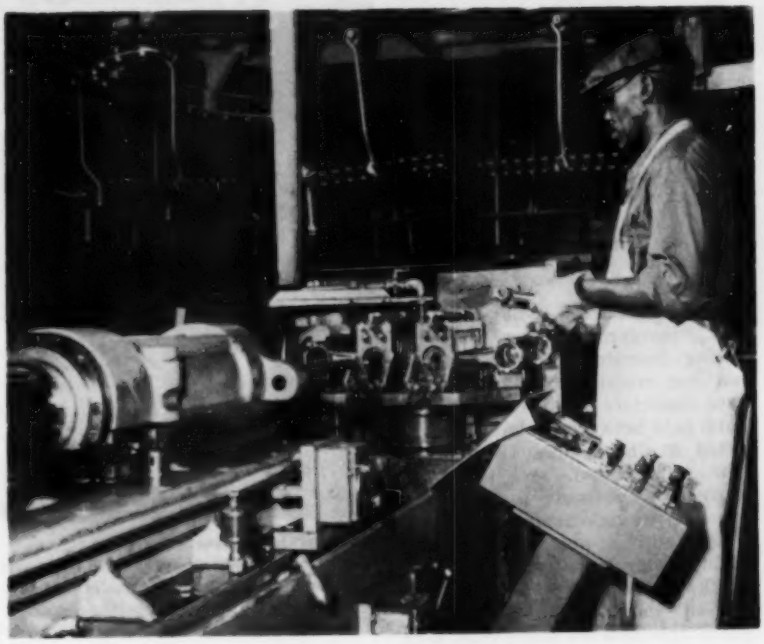
Another Valiant manufacturing innovation involves segregation of drilling and tapping on the head and block lines—instead of tooling a machine to do the job in the usual sequence.

There are several reasons for this. First, the two different coolants are kept separate, making it easier to drain the water-soluble oil used in drilling, and the mineral oil used in tapping, back to their own filtering systems.

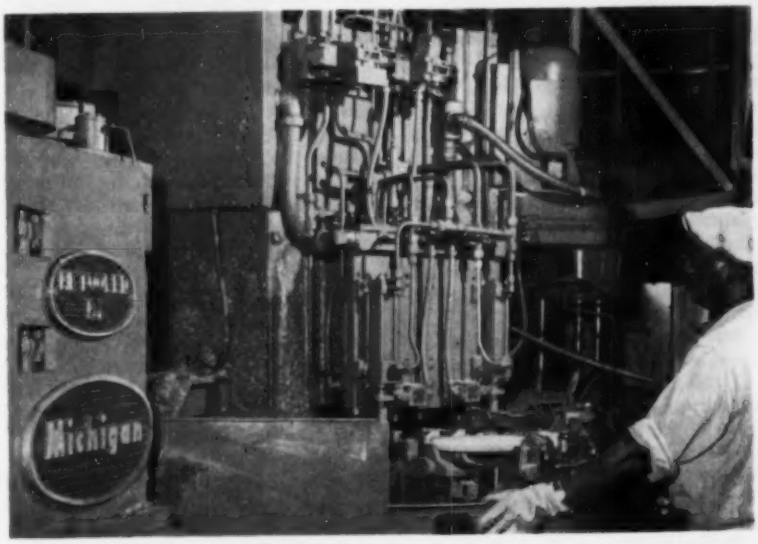
Second, it is easier to control tapping operations at one machine (which follows the drilling machines). And third, isolation of tapping simplifies maintenance of taps.

Another Valiant departure from conventional automotive practice: immediately following finish boring with honing. Conventionally, honing is a number of operations removed from finish boring. But the Chrysler people have found that honing doesn't correct all errors in bore size or shape, tending rather to follow the shape of existing bores to remove

Rebuilt machines team up with new ones to build Valiant's versatile engine



Horizontal honing . . .
This is a brand-new idea in fixturing and machining: crankpin holes in connecting-rod assemblies are honed horizontally in a machine designed especially for the job by Micromatic Hone, who built the equipment from available components. Operator loads eight rods in a fixture on one side of the working station, while a reciprocating hone works on a previously loaded set of parts. Similar machine hones wrist-pin holes in the same manner



Dials beat transfer machines . . .
Rebuilt by Michigan Special Machine Co from Krueger, Barnes, Sundstrand, and other components, two of these dial machines do the work that would normally be assigned to three transfer units. This dial drills holes, rough- and finish-mills joint faces, and mills bolt-mounting surfaces on aluminum intake manifolds. The second dial finishes the part, which is then transferred to subsequent operations via overhead conveyor

small amounts of metal and thus achieve precise dimensions.

By following finish-boring immediately with honing, it is possible to detect erors immediately, and to make corrections or rejections without expensive machining of a part that might not be usable.

Incidentally, rough boring of cylinder bores is done as early as possible in machining of the block. In this way, the bulk of the block material is removed to permit stabilization of the part for more subsequent machining operations.

Turning on chuckers

Another believed-to-be Chrysler "first" involves turning of main bearing diameters of camshafts on chucking machines. Conventionally, these diameters are turned with the shafts held between centers and supported at the middle (because of their slenderness), and only one bearing, or at most two, can be turned in a single setup.

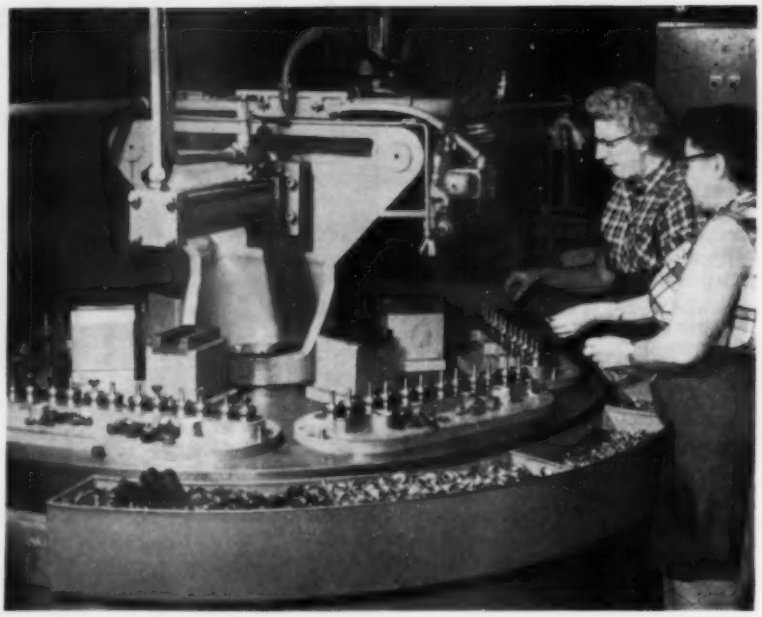
Now, with a new Acme-Gridley machine developed especially for this line, the part is centered and indexed radially to six stations, where light cuts are taken from each of four bearings, plus a gear-blank diameter. In this way, rough and finish turning is done in one setup that does the work of four conventional machines. Not only that, this setup eliminates the usual rough grinding operation that follows.

In the Valiant lines, emphasis has been placed on simple rotary or dial machines instead of complex in-line transfer machines—to keep initial costs down. Cost analyses made by Chrysler indicated that direct labor costs wouldn't be appreciably higher with the simpler equipment, that less floor space would be needed, and maintenance costs would be lower. And frequently qualifying operations needed to prepare a part for an automated machine could be eliminated.

While Chrysler has by no means overlooked automation in its compact car operations, it has at the same time appointed a task force, headed by Ray McCarroll, general manager of Chrysler's Engine Division, and V "Pat" Masi, Trenton plant manager, to carry out an extensive cost analysis program.

Purpose of the program is to compare prices of new transfer machines with those of rebuilt transfers, as well as with costs of new and rebuilt machines of simpler types.

The latter machines have been found by the Chrysler study to be the least expensive in most cases, so predominate on Valiant lines. Chrysler saved millions of dollars by using bases, heads, columns, controls and other major parts from existing equipment, then adding new tooling and fixtures.



One of few new machines . . .
Rotary Leland-Detroit setup assembles valve locks, springs, grommets, and retainers to cylinder heads. Parts are manually loaded into fixtures, then indexed to a point where a cylinder head is dropped over the assembly . . . at a tangent cylinder-head delivery line. Three operators complete well over 200 assemblies/hr

This revamping of existing equipment saved Chrysler considerable time in getting out the Valiant, just as it did Ford in getting its compact Falcon into production (*AM*—Oct 5 '59, p81). First machine tool orders were placed December 28, 1958, the last in March 1959. And the Trenton line was in production September 1 of this year.

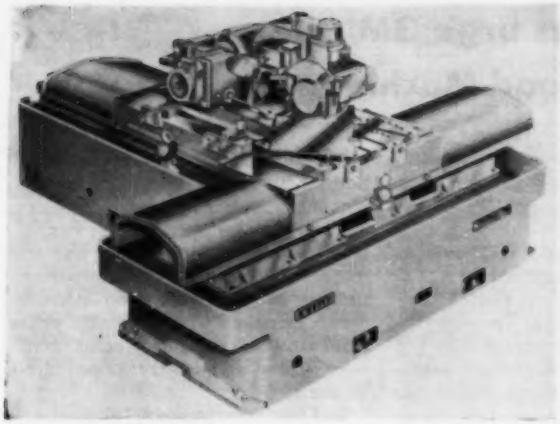
More than 90% of the Valiant engine line is made up of rebuilt equipment. Of 192 basic chip-removing machines, 17 are new and the rest rebuilt machines formerly used in V-8 engine production. Along with machines made available by consolidation of engine facilities, many machines were freed for rebuilding because they had been replaced by equipment designed to produce engines for 1957 and 1958 models.

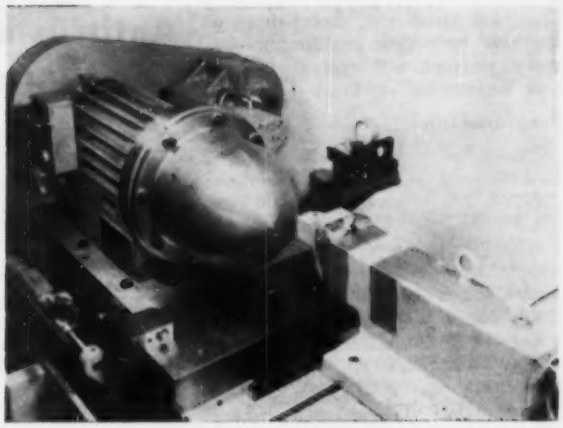
Because these machines were constructed along building block lines, rebuilding was not difficult. Rebuilt equipment proved so useful in producing Valiant engines that it was extended to include such tools as multiple-spindle nut runners.

But before they were approved for production runs, the newly rebuilt machines were subjected to a capability checkout consisting of eight separate checks for each machine. In the tests, a production spread of parts had to be made within a *percentage* of the total allowable tolerance (generally within 80% of total tolerance, but one machine held to 32%—an Ex-Cell-O for facing oil pump rotors).

Not only are machines and tools subject to severe checkouts, completed engines get a strenuous going over, too. A "Functional Quality Audit" is made on six to 12 of the finished engines ready for shipment. Here, the engines are checked out periodically on a dynamometer under road load—and at full throttle. Test engines are then disassembled and checked (from a customer's point of view) for bearing fatigue, oil pressure, bolt torque, clearances, and other conditions. This check is in addition to normal "run in" checks.

In this way, potential product trouble is immediately pinpointed, and eliminated. This system insures a high level of engine operating quality—beyond that achieved merely by controlling dimensional accuracies.





Building-block concept...
applied to design of this combination grinding and turning machine provides unusual versatility under a single continuous-path numerical control system. Machine is precise within ±0.0001 in.; control has electrical accuracy of 0.000025 in. and is fed data from punched tape

From motors to manipulators, AIEE talks...

Machine controls for the Space Age

"In the last four to five years, wages and salaries in Europe, including England, have gone up faster than ours. Where formerly our wages were four times greater than those paid in Europe, now they're only three times greater—and it is likely that the ratio will narrow still further," Walter K Bailey, president of Warner and Swasey, told the 11th Annual Machine-Tool Conference sponsored by the American Institute of Electrical Engineers. The conference was held October 19 thru 21 at the Sheraton-Cleveland Hotel, Cleveland, Ohio.

"Although European manufacturers have advanced to the point that they can compete with American manufacturers," Mr Bailey pointed out, "historically, countries which boost production boost their imports as well as their exports. **Thus, American machine-tool builders, despite the increased competition they are feeling from Europe, can expect to be selling the Europeans more goods in the future."**

He also told the audience of 600 engineers that many manufacturers are snared and deluded by the idea that all machine tools from Europe are cheaper than US models. Noting that, while labor rates are one-third of those here, the average price of European machine tool is only 25 to 30% under US prices, and that the better quality equipment is priced even closer to its US counterpart, he emphasized the need to evaluate each machine on its own merits.

"Reason for the differential between labor cost and price," Mr Bailey said, "is that European manual methods of manufacturing require more skilled machinists, rather than machine operators, and 50 to 100% more man-hours per machine than US techniques."

Precision "building blocks"

Designed to produce templets for parts in the missile and satellite program, a numerically controlled machine was described. Built by EX-Cell-O Corp, Detroit, the machine is capable of either turning or grinding to tolerances within ± 0.0001 in. Following the "building block" concept, a standard interchangeable turning and boring head is substituted for the grinding head. Work is held in, and rotated by, this head while a single-point cutting tool is mounted in a toolholder and block attached to the front table. The cutting tool is preset to a gage.

Continuous-path control

Fully automatic, the machine is controlled by a Bendix Aviation Corp continuous-path system. Electrical accuracy of the system is better than 0.000025 in. Manual positioning of the slide is possible only through the electronic system, although buttons are provided for jogging, inching, etc. Designed specifically for numerical control, the slides travel on flat and "V" ways, each containing roller bearings preloaded in assembly. The leadscrew nut is a ball-nut assembly preloaded to 1000 lbs. Despite a weight of nearly 1000 lbs, the slide requires only 5½ lbs pressure to overcome initial inertia plus static friction and only 5 lbs to keep it moving. Rollers are preselected and matched to within 0.000025 in. At each end of the leadscrew, it is supported by ball bearings preloaded to 500 lbs. The leadscrew is turned by a hydraulic motor, servo controlled.

Printed-circuit motors

Visualize the many alternative ways of constructing electrical machines other than those commonly used. Consider in what other forms the physical phenomenon can be produced. One result of this kind of thinking is the printed-circuit motor, described by R P Burr of Circuit Research Co, Cold Spring Harbor, NY.

The armature of one such printed motor is a disk 3.6 in. in dia, 0.030 in. thick and contains no iron. It weighs approximately one-eighth of its conventional counterpart. The air gap is flat and axial. Reduced weight means lower inertial forces, hence faster acceleration and stopping. Other advantages are low cost, low inductance (means low "noise"), smooth torque and commutation, and high thermal capacity.

For machine tools, three major

areas are visualized: direct drive of machine functions; positioning, memory element and special devices; and motors for auxiliary functions.

Programming

"Auto-Promt" is a new generalized three-dimensional system, developed at International Business Machines Corp, for describing and machining complex shapes by numerical control. Described by S M Matsa, the system uses internal programming of a general-purpose computer to permit programming by people other than computer experts. It is related to, but not identical with, MIT's APT system. Auto-Promt language describes parts in terms of planes, spheres, cylinders, cones, toroids, any general quadric surface, or tabulated cylinder.

Automation control

Operating experiences with static control on automated machine tools were described by K W Sheffer of Ford Motor Co, Livonia, Mich. The study was based on performance at the Sharonville plant. In essence, very little electrical trouble resulted from the static elements. The majority of difficulties were caused by external components such as limit switches, solenoids, selector switches, etc. Many problems were considered to be electrical when actually they were electrical manifestations of mechanical difficulties. For example, if a part did not properly locate to trip a limit switch, the line would stop. Because electrical trouble was suspected, an electrician would be called and because he found the trouble, downtime was logged by production personnel as "electrical."

Future of static controls

Many questions still remain to be answered about the future use of static controls. Among these questions are: Are static switches standard or special controls? Should they be used only where danger of contamination by coolants, etc, is avoided? Can regular maintenance electricians be depended upon to efficiently service these systems? Is it possible to follow JIC rules and principles with static circuits, to obtain the same high level of safety and performance as in conventional systems?

During the course of the three-day program, time was set aside from the regular technical sessions each day to provide four five-minute descriptions of new products.

Antitrusters urge GM sale of Euclid Road Machinery holdings

General Motors Corp has been hit with another monopoly suit aimed at holding down the company's size and expansion into new fields.

The new suit charges GM violated the Clayton Act's anti-merger provisions when it acquired Euclid Road Machinery Co in 1953. The acquisition marked GM's entrance into the manufacture of off-highway, heavy earth moving equipment. According to the government, the GM move "may substantially lessen competition or tend to create a monopoly."

Using the same law it invoked to block the proposed Bethlehem-Youngstown merger, the government asks that GM be ordered to sell off its Euclid Division. The government suit has several meanings:

- It suggests that a giant like GM cannot go into a new line of business through the merger route, without inviting antitrust attack.
- It raises the question whether some of the steam has gone out of the attempt by the antitrusters to split up GM's size and power in a single suit.

The GM-Euclid suit is the second monopoly-type case filed against GM by the government since 1956. That year, the antitrusters charged GM with a bus monopoly under the Sherman Act.

Several suits, not just one

The new suit is not a product of the grand jury investigation of GM, which is only now beginning to get evidence from GM officials. Whether the filing of the bus and Euclid suits indicates a government preference to take small bites (rather than one big break-up swipe at GM), it is safe to assume there will be more cases.

Here are the key charges made by the government in the Euclid suit:

- The acquisition may lessen competition or tend to create a monopoly in the $1-billion-a-year off-highway earthmoving equipment industry.
- It may substantially lessen competition in the manufacture of components—particularly diesel engines and transmissions—used in making such equipment.

As the government sees it, the GM acquisition means a much bigger Euclid for smaller competitors to deal with and the loss of Euclid as a customer for diesel engine competitors of GM.

GM and Euclid were not in competition in 1953. GM, though an important supplier of diesel engines, did not make off-highway earthmoving equipment. Euclid was the major producer of an important product in the industry, off-highway dump trucks. For several years prior to the merger, Euclid made over 50% of all such trucks produced in the U S.

But in the industry—which includes a broad range of specialized products—Euclid, either before or since the merger, is not dominant. Despite its position as the biggest producer of dump trucks, with all its other products (four and six-wheeled scrapers, dumpers, wheel tractors and coal haulers), Euclid accounted for only 5% or 6% of total industry sales. It did not make several important products, including crawler tractors, graders, bulldozers, tractor-mounted shovels and loaders.

But the government theory is that, against the background of GM's growth in other fields after making acquisitions of existing companies—in automobiles, trucks, buses and diesel locomotives—the Euclid acquisition may well result in a similar growth and eventual GM domination of still another industry. And, argue the antitrusters, it is this kind of "incipient" monopoly which the Clayton Act is supposed to prevent.

The government backs up its theory with various market figures. For example, it says that Euclid's total sales in 1952 were over $33 million, while GM Euclid Division sales have increased to reach $100 million in 1956 and $90 million in 1957. And that, while Euclid had over 50% of dump truck sales in 1953, Euclid Division sales reached about 80% of the market last year.

The government will also hit hard on diesel engines and transmissions.

Though the anti-merger law has been used (as in Bethlehem-Youngstown) to prevent a merger, no court has yet ordered a split-up under its provisions. This is what the government wants in the GM-Euclid case, however. But even if GM finally is forced to spin off Euclid, GM would still be free to start in the business again—as long as it did not violate the Clayton Act again by acquiring an existing company.

US trumps Russia's spark machining ace

A new electrolytic machining unit, with die-sinking performance surpassing that of Russia's highly touted spark machine (*AM*—Jul 27, '59, p92), has been developed by Anocut Engineering Co of Chicago. The Anocut machine removes 18 to 60 cu in. of metal per hour while producing 10 to 100 microinch finishes—with no electrode wear.

Material is removed by passing continuous direct current through a rich salt-water solution between the positive workpiece and negative electrode. The electrolyte is pumped through the copper or steel electrodes at 100 to 200 psi and is reusable until contaminated with metal removed from the workpiece. The salt does not go into solution with the metal as it is cut and, because hydrogen is attracted toward the cathode, there is no hydrogen embrittlement in the workpiece. There are also no sparks, arcs, or high temperatures.

Old principle, new application

The electrolytic machining process has been used by Anocut for some time, but previously could only be applied with a rotating wheel. Now a non-rotating shaped electrode can be plunged directly into the workpiece at penetration rates of 0.001 to 0.005 ips.

Anocut machines in regular production have power supplies of 300, 600, 1000, 1500 and 3000 amps and metal removal rates ranging from 0.030 to 0.3 cu in. per minute. Larger capacity units with proportionally greater metal removal rates can be supplied. Normally a removal rate of 0.1 cu in. per minute can be concentrated in 1 sq in.

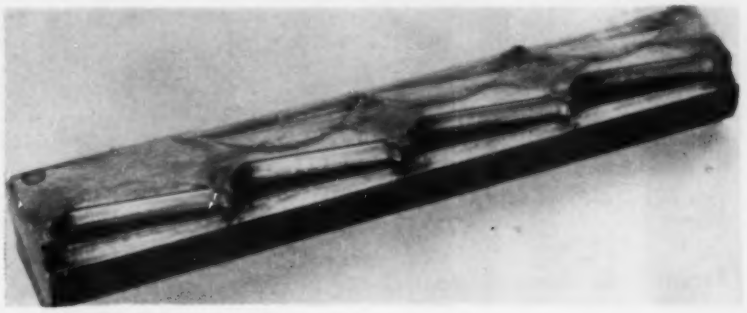
Finish and accuracy

On most materials the machine will produce a finish better than 30 to 40 microinches and on the superalloys the finish will be better than 20 microinches. Because these finishes are obtained at top metal removal rates, a finished piece can be made in a single operation.

Normal accuracy is 0.001 to 0.002 in. and accuracy under optimum conditions has been better than 0.0005 in. The machine will cut holes and slots as small as 0.050 in. dia.

Anocut intends to sell its machines for approximately $30,000 without the power pack which will cost an additional $6000 to $30,000, depending on the capacity.

Electrolytic cavity-sinking machine . . .
has work space at right and drivehead mechanism at left. Work area is enclosed in plastic to prevent spattering of the salt-water electrolyte which is pumped through the electrode.



Test bar of Udimet 500 . . .
shows seven identical pockets the size and shape of jet engine turbine buckets. Each pocket was machined in about 30 seconds.

Anocut HCS-59 Electrolytic Cavity Sinking Machine

Power supply	dc
Voltage at tool	5—15 v
Amperage at tool	10—10,000 amps
Metal removal rates	18—60 cu in. per hour
Surface finish at maximum removal rate	10—100 microinches
Working area needed for full power	1 sq in. per 1000 amps
Largest cutting area	100 sq in.
Smallest cutting area	0.050 in. dia
Electrode material	copper or steel
Electrode wear	none
Cutting frequency	constant dc
Cutting gap size	0.0005—0.005 in.
Heat penetration of die	none
Cavity accuracy	± 0.0005—0.003 in.
Maximum overcut	0.0005 in.
Internal corner sharpness	0.010 in. radius
Blind corner sharpness	0.010 in. radius
Applications	HSS, high-tensile alloy steel, superalloys

This is the new Machine Tool Hall at Brno. Motto emblazoned across the roof (at extreme top of photo) reads: "The Third Five-Year Plan—Our Way of Overtaking the Most Advanced Capitalist Countries"

Accent is on numerical control and building blocks at Brno Fair as . . .

Czech machine tool push pays off

The Communists gambled heavily on machine tool production when they took over Czechoslovakia in 1948—relying on traditional Czech industry and engineering ability to put across a breakneck expansion program that would make Czechoslovakia a power in world markets.

The gamble has paid off handsomely. Machine tool output has more than doubled since the program began, and Czechslovakia today ranks fifth among world suppliers of machine tools.

Fast-growing production has been paced by engineering innovations and by acceptance and further development of such machine tool concepts as numerical control and building blocks, both of which were much in evidence at this year's Brno Fair, showcase for Czech industry, where machine tools dominated the show.

On display were 65 different models, the end result of streamlining production down from 400 models. The Czech's theory: "Let's limit production to the machines we can best make ourselves, and let imports fill the gaps."

As evidenced at Brno, the Czechs obviously feel that numerically controlled machine tools lie well within their production capabilities. Shown, for example, were two tape-controlled millers, a punch-card-controlled plano-miller, a radial drill with pushbutton programming of speeds and feeds, a drum turret lathe with electro-hydraulic stops instead of cams (for faster setup), and several auto-cycling hydraulic copying lathes. One new copying attachment has a rotating master for copy-turning such non-circular components as camshafts.

Prominent, too, were attachments for standard machines, such as a superfinishing unit for lathes or cylindrical grinders. And there was a simple, effective device for facing spherical surfaces on an ordinary lathe: an adjustable ball-jointed rod that links the tool slide to the tailstock, giving the tool an arctuate travel, radius of which is determined by the length of the rod.

Outstanding were "magnetic scales" (Fig. 2) for checking and correcting the indexing accuracy of gear cutters—two disks temporarily coupled to the worm gear and driving worm of the dividing table. Disk rims are coated with ferrous oxide, and pre-recorded with a fixed-frequency tone controlled by a crystal standard. As the table rotates any frequency difference between the two disks (caused by errors in the kinematic train) is detected by a phase shift meter and continuously recorded on a strip chart. Tracing,

obtained after only one table revolution, gives required shape for corrective cam.

Czechoslovakia's adaptation of the building block principle was evident at Brno: unit heads have been cut from 24 types to six—all standard sizes—with spindle capacities ranging from 10 to 100 mm.

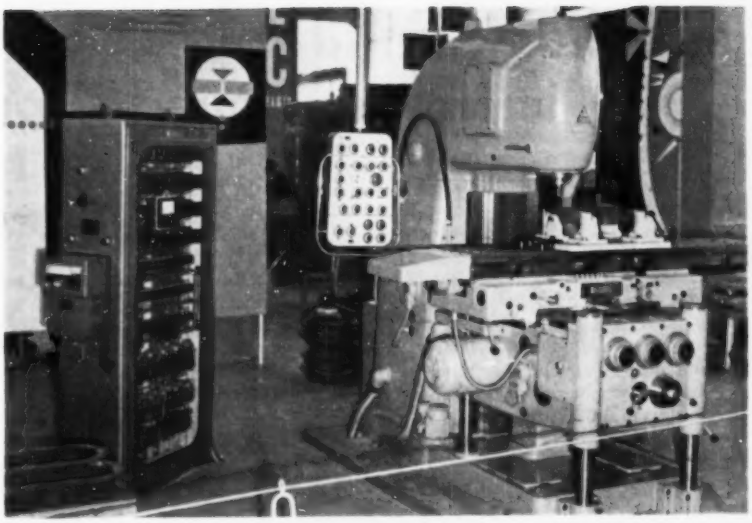
Also shown were several kinds of beds. Here the range has been pared down from 55 to 25 types. One assembly on display, built from these components, was a four-station rotary machine with 10 heads for drilling, reaming and tapping.

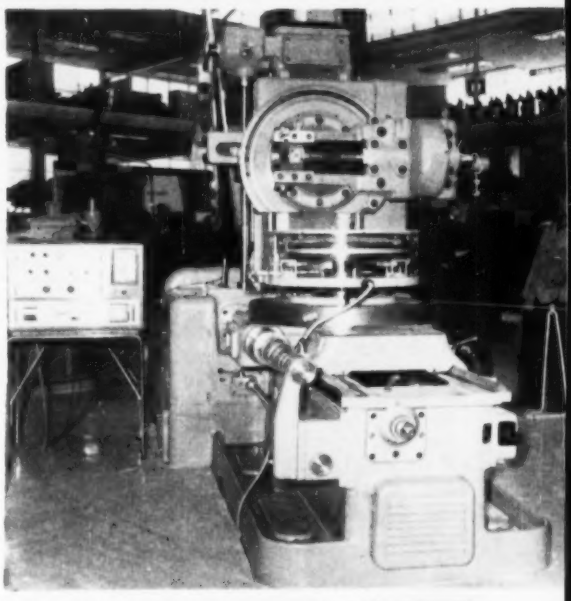
Simplifying national output

This cutting-down on number and types of machine tools will be carried out to an even greater degree in the future by the Czechs, who intend to reduce 400 models to 260 basic types—and the stress will be on semi-automatic tools.

Noteworthy at Brno:

- A vertical miller programmed by 35-mm film, which controls slow and fast table feeds in three dimensions (Fig 1). Table travel is regulated by adjustable stop dogs (although a supplementary dekatron counter can be used as well for programming these moments). For normal operation all controls are in the pendant. Spindle speeds range from 28 to 1400 rpm in 18 steps, and table has 24 feeds.
- A precision horizontal borer (Fig 3) has optical-projection setting of spindle head and table in both planes. Covered scales on each slideway are projected and magnified to give direct reading on individual viewing screens. Separate vernier dials permit accurate manual setting to 0.01 mm. One lever controls headstock, spindle and table movement, also preselects feeds and speeds while running. When hole depth is reached, spindle thrust can be preset to stop and retract automatically. Spindle capacity is 63 mm, boring depth 560 mm.
- Semi-automatic metal spraying machine feeds two electrode wires from coils in the welding console through flexible cables to the gun, where compressed air deposits atomized metal on the rotating work chucked in the lathe. Single starting switch coordinates electrode feed and air supply, preventing accidental fusion of the wires and damage to the gun. The two circuits are inrelocked to prevent short circuiting or faulty metallization. Deposit rates vary from 14 kg per hour for steel to 5 kg for aluminum.

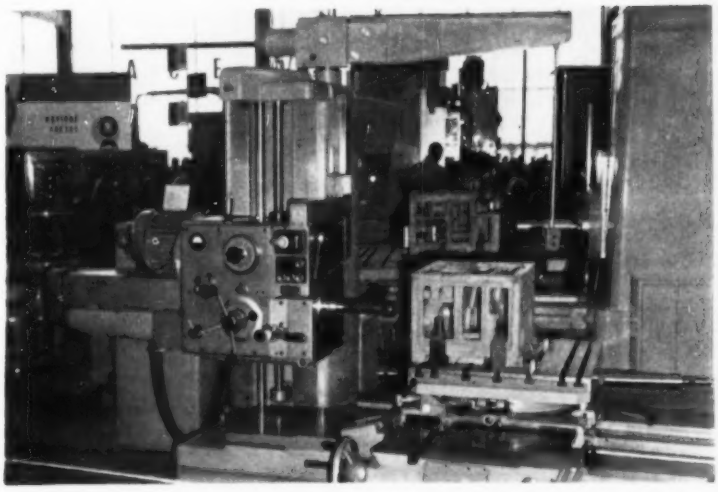




1 (above) . . . Tape-programmed (on 35-mm film actually) vertical miller

2 (right) . . . Portable unit for checking accuracy of gear-cutter dividing tables

3 (below) . . . Precision horizontal borer with optical projector



Auxiliary mill-table
improves accuracy, speeds production

By Alfred O Haeme, tool superintendent, The Warner & Swasey Co, Cleveland, Ohio

A tooling system worked out by Warner & Swasey's shop-tool engineers combines the accuracy of fixture setups with the convenience of a rotary table. It is here employed on a DeVlieg Jigmil, but can also be of great value on a horizontal boring mill or similar machine.

This system has many advantages over individual-fixture methods; just to mention a few, it can be said that:

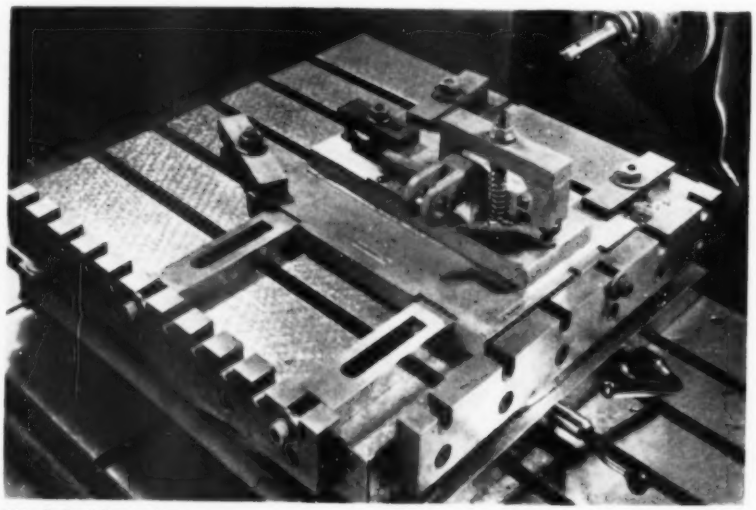
- It readily lends itself to table setups for parts needed in small quantities.
- Fewer and less expensive fixtures are necessary, consequently tooling cost is reduced.
- It maintains consistent accuracy without special care on the part of the operator.
- Setup time is reduced and flexibility increased.

Basically, the tooling system consists of work-holding fixtures which are essentially square indexing-auxiliary tables. Extreme accuracy is achieved by careful over-all machining. The four sides are milled in slow stages; that is, all sides are roughed in one tool setting, the table is simply indexed for each pass. Finishing cuts are carried out in the same way, but as a mere touch, insuring squareness of all sides relative to each other and at equal distances from the center of the table. The top surface is hand scraped, parallel with the base, after careful machining.

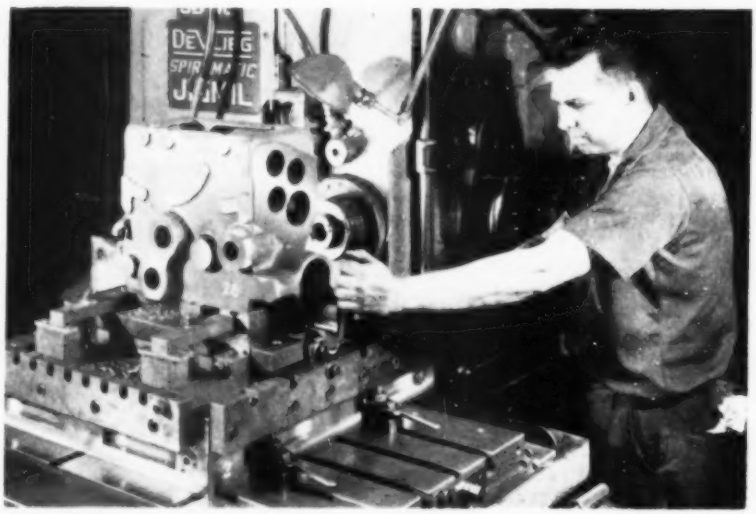
Two adjacent sides are selected and checked against special gages developed by W & S's shop-tool department. When found OK, hardened and ground steel rails are mounted on these sides to carry their dimensions above the table surface. Bolted in position with ½ in.—13 socket-head capscrews, the rails present 1 1/16-in. barriers on two sides.

U-shaped slots, ¾ in. wide spaced on 2 and 4-in. centers, are cut into the protruding rail sections. They provide a choice of stations for attaching parallel-spacer blocks and fixture bases to the side rails. When the spacer blocks are too long for mounting with a single bolt, longitudinal slots are machined to permit use of short bolts at each end. Where no blocks are required, as when a fixture is bolted directly to the side rail, hardened wear plates are attached to the fixture sides.

Fixtures must sometimes be raised on blocks to lift them above the top of the index table (see lower photo). Such jobs demand two-level spacer blocks which are bolted to the side rails at the lower level and join the fixture on the upper. The locating sides of each fixture are marked with the type of spacers it requires so an efficient setup can be duplicated when a job is rescheduled.



Work-holding fixture . . .
is located relative to index-table rotation. Two long parallel blocks are required between one side of the fixture and the side rail and a short block on the other side to retain location. Conventional straps hold strap-type fixture to the table



Raised on parallels . . .
to accommodate protruding casting sections, the work-holding fixture is located in relation to side rails. This setup calls for spacer blocks having two levels; the lower bolted to the side rail, the upper to the fixture

Wheel-spindle forging . . .
Three diameters are ground according to dresser cam (left) by diamond tool (right). Five diamonds are set in each of three faces around the hex of the dressing tool

One pass grinds Cadillac wheel spindles

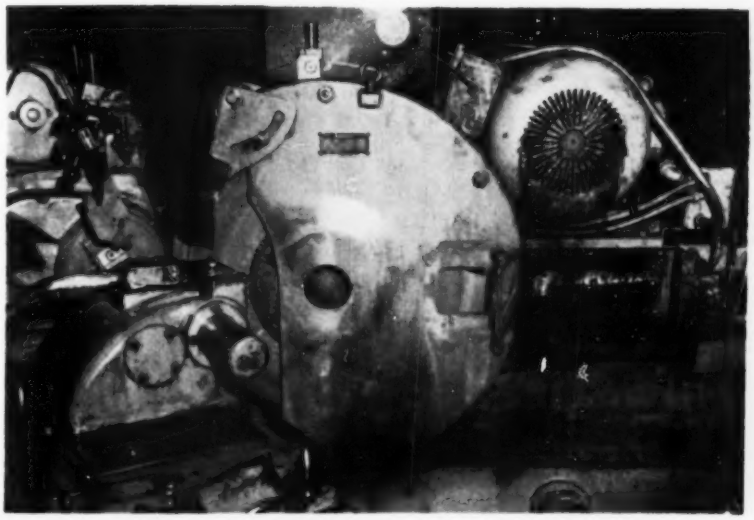
Diamond wheel dressing combines with a special angled grinding wheel at Cadillac Motor Car, Detroit, to produce 35-microinch finishes and 0.0005-in. accuracy on three spindle diameters in one operation. Parts are front-wheel bearing spindles, made of steel cold extrusions that are rough-turned, induction hardened, and tempered before being ground.

The grinding wheel is angled at 30° to a line perpendicular to the work—the Cincinnati grinder was built this way intentionally to allow a wider working wheel face than normal. Wheel speed is 860 rpm.

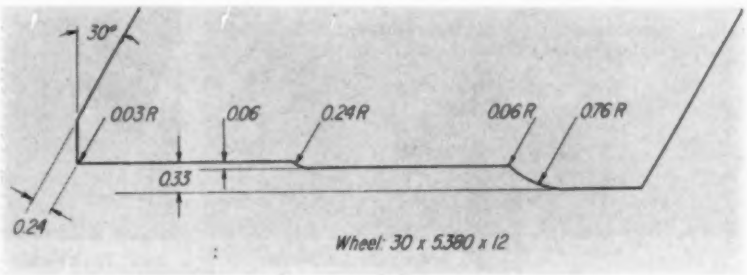
Main contributor to the accuracy and surface finish attained when the wheel grinds three diameters in one pass is diamond dressing, accomplished at the rear of the wheel by a hexagonal dressing tool under cam control. The wheel is dressed automatically after every 35 spindles have been ground. The dresser removes 0.001 in. per pass in a cycle that requires 3 minutes.

The dresser has three faces fitted with five diamonds each, all mounted in a straight line on each face. Multiple stones produce an open wheel face and allow a greater number of workpieces per dressing than a single-point dresser. The tool may be flipped and used upside down after the three sets of stones have dulled on the top side—to provide six positions for the dresser.

L D Guinan, general supervisor of tool service, picked multiple diamonds for long wear and high finish.

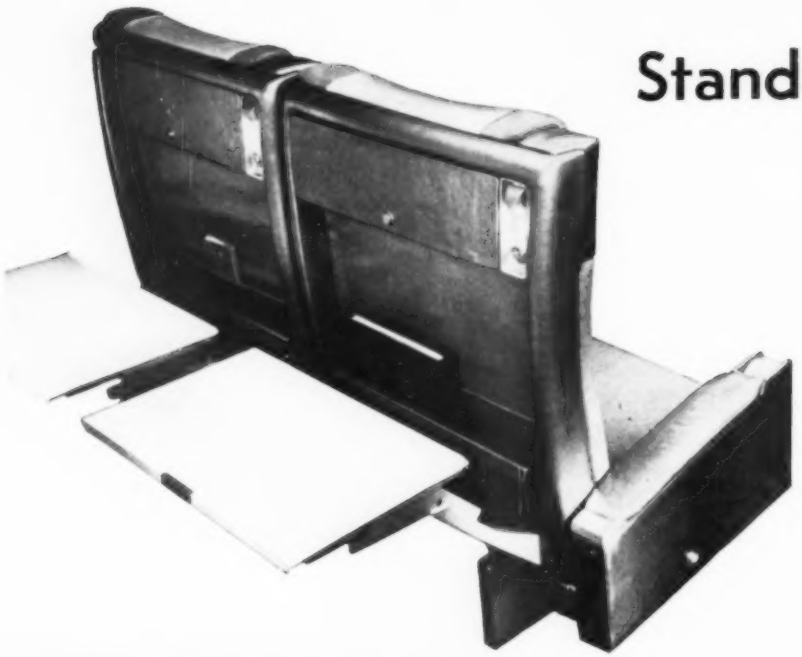


Dresser mounts at rear of wheel . . .
Opening at right is for dressing tool and control cam. Wheel is angled to work axis 60° to provide wider face against work than is possible with straight-on wheel

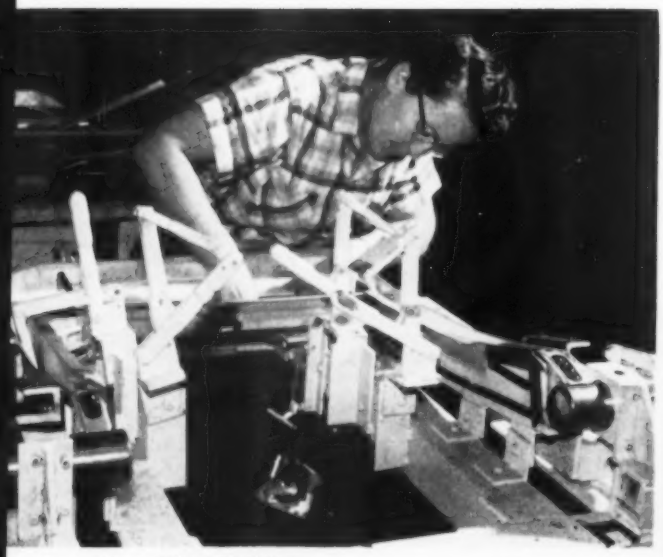


Wheel profile . . .
Three straight sections and two radii are ground on the front-wheel bearing spindle. Part of the profile clears a spindle area that is not ground

Standard parts



"Unitized" seats for Douglas DC-8 Jetliners involve short runs of complex assemblies. Douglas has found a way to do the job cheaply by teaming up portable fixtures with interchangeable parts for different kinds of seats



1 . . . Class "A" jigs
. . . with quick-acting Cleco clamps hold the back structure of a DC-8 seat as its different components are assembled onto it. The varying parts are accurately scribed and trimmed to fixture, insuring interchangeability with other subassemblies that go into different kinds of seats

2 . . . Tack welding
. . . is done in the positioner at rear. Then the accurately aligned seat back components are Heliarc welded to complete a subassembly. External weld bead is later ground smooth and detail parts are added to the seat back

and flexible jigs hit the short-run jackpot

Economical short-run production has long been the manufacturing engineer's particular headache. But this time manufacturing people at Douglas-Santa Monica have managed to solve the problem, with an assist from design engineers.

The product: unitized seats for Douglas DC-8 Jetliners. These seats are standard equipment on all DC-8's delivered to some 17 airlines, and about 1000 of them are made each month. Complicating the problem of relatively low production are three variations in the seats themselves, which are designed to seat passengers four, five or six abreast.

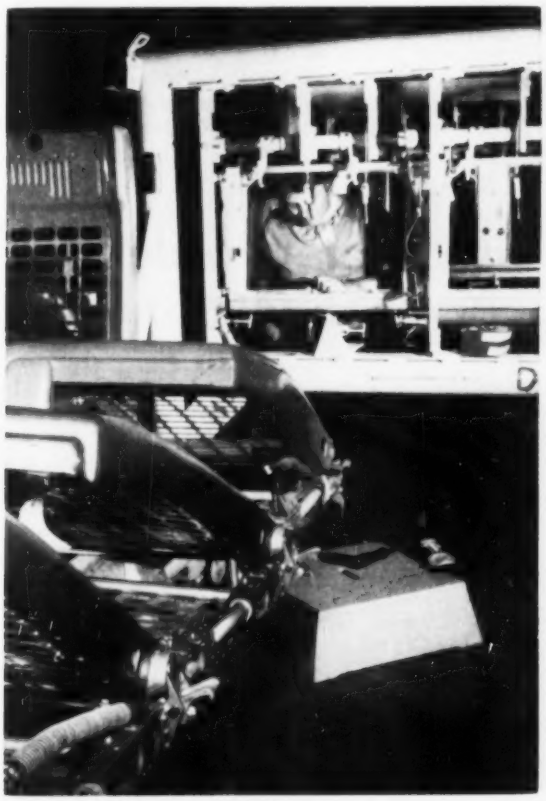
The assembled units are complex packages into which many passenger-comfort facilities are fed. For example, a fluorescent reading lamp is flush-mounted in the seat's headrest, and a folding utility table is recessed into the back of each seat. Also recessed into the seat's back is a panel containing a table light and switch, a call button for the stewardess, a cold air outlet, a covered ash tray, a personal-effects pocket, and an emergency oxygen system.

Besides all this, a hydromechanical seat-lock mechanism is housed entirely within the seat bottom and life-vest storage is provided by a pocket attached to the bottom of a plastic cushion-suspension strap.

To eliminate "tailor-made" parts and to build up production to an economical volume, Douglas engineers use as many standard parts and interchangeable components as possible in designing these complicated assemblies. As a result, the production line begins with a reasonable quantity of identical individual parts, sections of sub-assemblies, and components for all the seats—regardless of type. Only when the various sub-assemblies go together toward the end of the line does the difference in units become apparent.

Welding and riveting of components starts seat production. Structural backbone of all units is $1^{3}/_{4}$-in tubing, to which all fittings and sheet metal are ultimately attached. Alu-

3 . . . Spot welding
. . . of seat assemblies is done on this Sciaky setup. Here seat doors are joined. This operation is followed by burring and countersinking holes in channels, and by dimpling and riveting of the channels



4 . . . Versatile assembly jigs
This one holds seat-bottom components in accurate alignment as other components are joined on. By rearrangement of clamps and alignment pins, the jig can be used for other parts

5 . . . Portable fixtures

. . . such as the ones shown here can handle any kind of Douglas Palomar seat—double, deluxe, first class, tourist class—right or left of the aisle as required. Here a reading light unit is installed in the back of a nearly completed seat

6 . . . Final operations

. . . on completed assemblies include wrapping the seats in Pliofilm for shipment to the DC-8 assembly line at Douglas-Long Beach (Calif). Aisle arm rests have been covered with leather, seat bottoms sprayed with color and decals added

minum sheet (0.020 in. thick for seat backs, and 0.032 in. thick for bottom structures) is formed into monocoque and closed torque-box structural members. These basic components are tack-welded together to make up a frame which is later joined by careful manual Heliarc welding.

Positioning, trimming, and fitting are of the utmost importance at this stage to insure accuracy in final assembly. To simplify this work, portable welding positioners with a high degree of flexibility were developed at Douglas. Like other assembly jigs on the line, these make good use of quick-acting toggle clamps and other devices for holding a variety of parts rigidly and accurately. Loading, clamping, and unloading is quick and easy without sacrificing accuracy.

Jigs and fixtures can be moved to different parts of the line as needed, or they can be rearranged to support different parts. As a result, when production requirements vary unit by unit, no excess tooling is forced to stand idle.

Nor is there ever a log-jam of work piled up around one fixture, that's because other fixtures can be put to work on the same parts.

Rush of new orders at Frankfurt Auto Show booms German output

West German automakers' order books were filled to overflowing last month as the Frankfurt Automobile Show closed its doors after an 11-day run, during which more than one-million people viewed the industry's newest models.

Before the Show it had been expected that prices would show a marked drop as Germany made its bid to hang onto the foothold it has made in the United States and overseas markets, in the face of competition from the new US compact cars. But price slashing occurred in only a few makes (Ford of Germany and NSU-Fiat) and even at that was moderate. Otherwise, prices stayed fairly firm.

Prime reason why German automakers didn't cut prices to meet competition from U S compacts in world markets is that the Germans don't consider the so-called American "small cars" small cars at all and hence not really competition for Volkswagen and similar small inexpensive German makes.

As the Show opened, the Society of German Motor Manufacturers announced that the industry had set a new production record for the first eight months of the year, and that production records were still soaring upward as if the impending clash with US compacts held no significance whatsoever.

Actually, the Germans today are focusing their attention on production of ¾ to 1½ liter cars for the domestic and European markets, on the theory that the European public, just as the American public, would like to drive a bigger car for its snob value once in a while. More than half the vehicles on show were in this class.

France's new Renault models seem to be a far greater source of worry to German automakers than US compact cars—particularly to Volkswagen. Large crowds milled around Renault's new Caravelle (known in Europe as the Florida) and the snappy new Dauphine, both of which are calculated to give Volkswagen a run for its money in world markets, since Volkswagen hasn't changed since WWII.

Russia made its first this-side of-the-Iron Curtain appearance this year at Frankfurt, found its Moskovitches and Volgas weren't attracting nearly as much interest as the German and French cars. But two north German dealers have agreed to take 800 Russian cars under terms of the new Soviet-German trade pact. Two reasons for the comparative unpopularity of the Russian cars: poor finishes and all-too-obvious copying of Western styling.

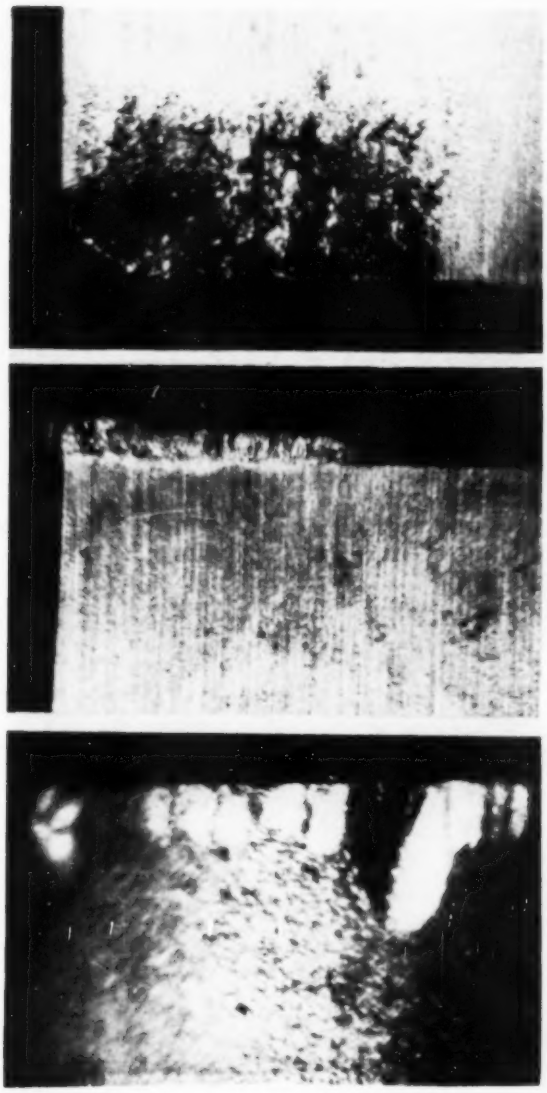
A better instrument to measure tool wear

By **Inyong Ham**, assistant professor, Pennsylvania State University,
and **Joseph Stanislao**, assistant professor, North Carolina State College

This modified Brinell microscope allows us to observe and measure tool wear without removing the cutting tool from the test lathe. It therefore eliminates the usual wear-measuring problem, where the tool must be taken from the setup, then replaced, thereby making inconsistent the cutting-edge position of the tool in a long, continuous-life test.

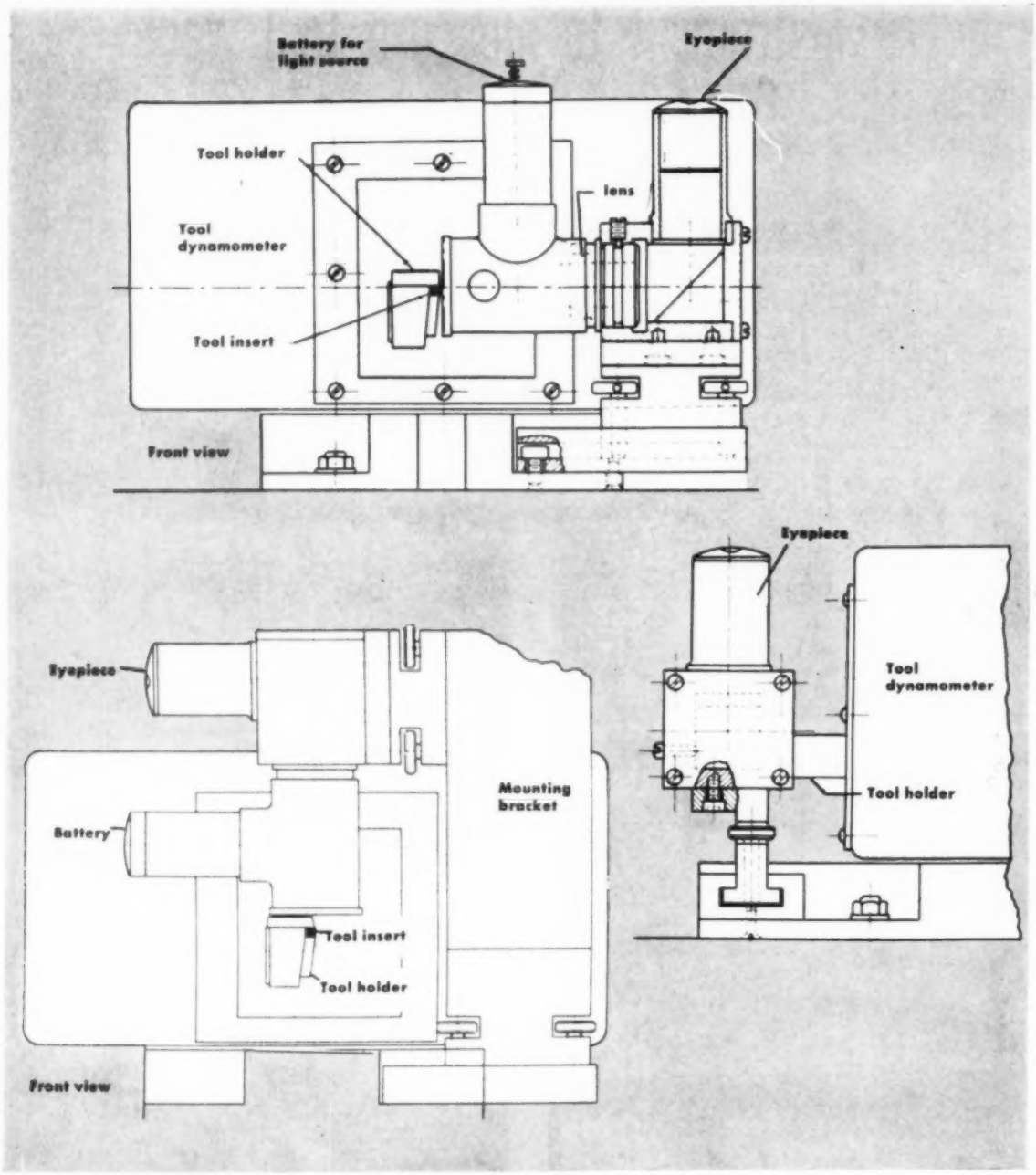
Measure at the machine

Observations can usually be made with a Brinell microscope mounted next to the cutting tool, but measurements are usually made with a toolmaker's microscope at the bench. The special housing on our Brinell microscope allows measurement of flank wear, craters, and edge buildup at the machine. In addition, the modified unit can be fitted with a 35-mm camera to take photos, which



Tool wear . . .
Cratering, edge buildup, and flank wear can be seen and photographed on the tool in place in the lathe

Machine setup . . .
Microscope can stay mounted during test cuts. A 35-mm camera can be mounted on top of the eyepiece to make record photos



Microscope mount . . .
Instrument can be mounted horizontally to observe flank wear and edge buildup (top and left) or vertically to observe cratering (left). Unit will rotate 90°

can also be measured with accuracy.

Some typical photomicrographs of tool wear are shown on page 107. These photos also provide permanent records of wear test.

The instrument was made by adapting the lens and eyepiece from a standard Brinell microscope to a new housing of aluminum alloy. This supports the Brinell elements in their original location, with focal length unchanged. A 45° mirror bends the image 90°, but the design principle can be adapted to any desired angle. A clamping screw inside the housing prevents the mirror from changing position when microscope is moved.

Two viewing angles

The housing also includes a light source that can be rotated 360° to place it out of interference with the lathe and tooling. The whole mechanism can be rotated 90° to shift from top to side views of the tool—to measure top cratering or flank wear.

A similar microscope is being operated to observe milling and drilling operations.

Aluminized fabric . . .
helps blankets to maintain temperature during preheat, weld, and stress relief

Reflective blankets cut welding costs

By Edward J McGinnis manufacturing engineer,
Large & Medium Turbine Dept, Westinghouse Electric Corp, Lester, Pa.

This new kind of insulating blanket depends partly on a reflective coat of aluminized fabric to maintain constant temperature in large castings during welding operations. Used for the first time by Westinghouse Electric Corp's Steam Div, the lightweight blankets will save the company about $10,000 a year by reducing the consumption of electricity and gas and the maintenance of induction-heating equipment.

And the blankets themselves are less expensive and more durable than the heavier ones they have replaced. In the Large & Medium Turbine Dept they are now standard equipment in the welding of cylinder bases, covers, and all subassemblies for steam turbines.

The new blankets measure 3 x 4 ft and have a 1-in. filler of fiber glass. The old ones were the same size but were made of asbestos and stuffed with 4 in. of fiber glass or imported insulation material. They cost the dept $65 each to make.

Weighing 25 to 30 lb, they were difficult for a man to handle. Usually they had to be positioned with an overhead crane on top of large castings, and they broke down under heat after three days of service.

The new ones are made in the plant for $18 each. One side of the blanket, the side which is laid directly upon hot castings, is made of Scotch-Shield brand aluminized fabric, Type 71.

These blankets weigh only 7 or 8 lb and are more flexible than their bulky predecessors. During test operations, they showed no signs of deterioration after more than four weeks of heavy use. They are less harmed by heat, because the aluminized fabric reflects radiant heat back to the casting.

In addition to ease of handling and durability, the aluminized blankets provide a substantial saving in process time: an average reduction of one hour for heating a chrome-steel casting to 500 F.

Before welding, alloy steels must be preheated to temperatures ranging from 300 to 500 F, depending upon Westinghouse metallurgical standards prescribed for each alloy. The welder then exposes a small area to weld. He moves along the casting re-covering finished welds before he moves on to another area.

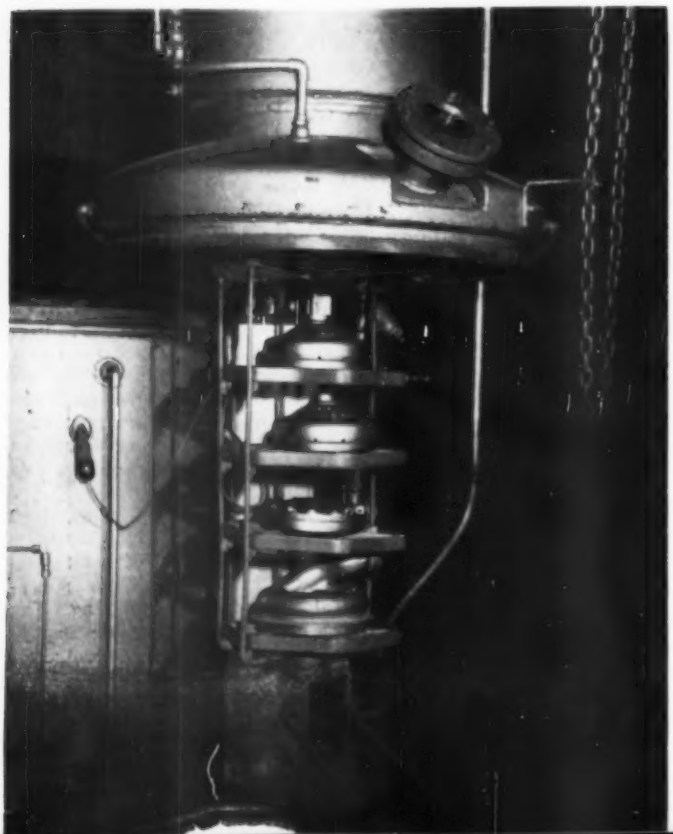
The blankets are so effective that welders may kneel or sit on the covered, heated castings without being burned. When the welding job is finished, the casting is cooled to room temperature slowly and evenly under the aluminized blankets.

In addition, there are stress-relieving operations requiring temperatures around 1250 F. While blankets cover the outside to retain heat, the casting is gas-heated from the inside to the temperature required.

For finish-machined castings, which are preheated by induction heating instead of gas, the aluminized fabric is cut into smaller pieces and wrapped around the part only near the area to be welded. The fiber glass filler is not used in this application.

At Westinghouse the aluminized blankets and wraps cover castings weighing as much as 50 tons for all preheating operations and subsequent local stress relieving. The Large and Medium Turbine Dept is also experimenting with protective clothing of aluminized fabric for welders.

Modern vacuum furnace . . .
brazes complex stainless-steel assemblies. Sight-glass in furnace above) allows operator to observe brazing operation. Furnace can hold vacuum of about 0.1 micron; work capacity is about 60 lb. Loading (below) is simplified by swivelling cover and chain hoist. Triple pumping system with diffusion pump speeds pumpdown. Furnace can also be used for annealing, hardening, and sintering



Vacuum cuts

By R C Gibbons, chief metallurgist and A Goudreau, master mechanic
Bendix Aviation Corp, Utica Division
Utica, New York

Complex stainless steel assemblies can be brazed in a number of ways, but, because of their relative cost and inflexibility, some of the old, standard techniques are running into stiff competition from vacuum and controlled-atmosphere processes. The Utica Division of Bendix Aviation Corp recently installed a vacuum furnace and found that it:

- **cut brazing costs**
- **increased productivity**
- **produced quality brazes**
- **added flexibility**

Standard practice for high-temperature brazing of stainless steel and high-temperature alloys with AMS 4775 or similar brazing alloys has been to braze the parts inside a sealed box or retort. The enclosure could be either "sand-sealed," using special high-temperature sealing material, or take the form of a welded trunk or box. The box is then purged with purified dry hydrogen (dew-point –70 F) and heated to 1850-2150 F, depending upon the brazing alloy, while continuing to pass hydrogen gas through the box.

When the assembly has been brazed, as estimated by time and temperature, the box is removed from the furnace and allowed to cool. All the while, hydrogen is still being passed through the box. A sand-sealed box can be opened immediately upon cooling, but a welded box must first be purged with an inert gas, then cut open with a torch.

Better method sought

Bendix-Utica has been using this welded box technique for the past five years in brazing stainless-steel assemblies for aircraft combustion starters, air turbine starters, and other complex, critical work. Though the work produced is of high quality, the welded-box plus hydrogen-gas approach has several disadvantages:

- Heating rate is usually slow in the last stages above 1500 F unless small, light loads are being brazed. This permits the brazing metal to alloy with the base metal before flowing into the joint.

cost of brazing stainless steel

● There is no sure way to know if and when the braze is completed. You depend upon time, temperature, and experience. Too short a time gives an incomplete joint; too long a time, a coarse-grained joint.

● Costs are high. Dry purified hydrogen is relatively expensive, and box life is short. The box warps and shrinks as a result of repeated welding and cutting open; its outer surfaces are quickly oxidized. Whether the boxes are made of Inconel or low-carbon steel, their cost per heat is about the same—high.

● Many of the newer and better grades of high-temperature alloys contain aluminum, titanium, or similar materials in quantities that make the alloys unsuitable for hydrogen brazing.

Vacuum equipment

Vacuum equipment or the use of an inert gas such as argon were two possible solutions, but our engineers had investigated vacuum equipment and found it wanting, and inert gases were too expensive.

Recent design advances in vacuum furnaces, however, refocused our attention on vacuum equipment, particularly on the Vacu-Master furnace developed by the C I Hayes Co, Cranston, RI. We visited the Hayes testing laboratory to make a pilot study, and the tests proved so successful that we recommended the vacuum process to Bendix management. The changeover was made shortly thereafter.

Once installed, this new vacuum furnace more than lived up to expectations:

● It has proved more capable of rapid heating in the high temperature range, and the heating rate can be controlled. Thus it is easier to get complete penetration of the joint before excessive alloying takes place.

● A sight-glass in the furnace lets the operator watch the load come up to heat and watch the brazing operation. This practically eliminates under- or over-heating.

● Trunks and atmosphere equipment are no longer needed. Trunk welding and the subsequent opening operations have been eliminated, as has the lifting and handling of heavy loads into and out of the furnace. All these factors help to reduce brazing costs.

These advantages were anticipated. What remained to be seen was whether the vacuum furnace could equal the productivity and work quality of hydrogen brazing.

In hydrogen brazing, the furnace can be kept at full heat while one load is removed to cool and another is placed in the furnace. Vacuum furnaces, on the other hand, must go through a complete heating and cooling cycle for each load. Until recently, the vacuum furnace's ability to heat a load more quickly did not quite counterbalance its slower cycling time. The new Hayes furnace, however, provides a much more rapid cycle. It has a large-area heating element with baffle plates to focus the heat upon the work, and a cold-wall (water-jacketed) construction, with a separate, non-baffled cooling chamber so that heat can radiate rapidly into the surrounding water jacket during cooling.

Rapid cycling

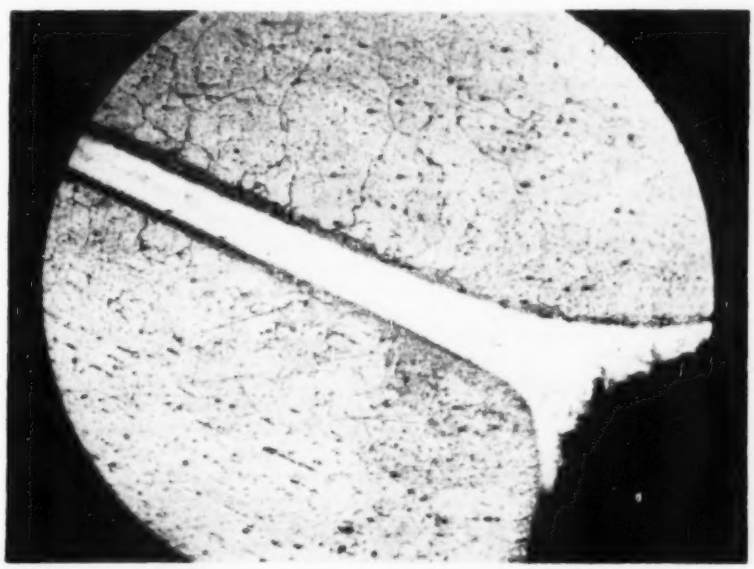
Rapid cycling and easy loading (photos, left) have permitted us to run three heats per shift, three shifts per day, with time to spare. As many as five heats per shift and eleven heats per day have been run. A complete brazing cycle takes about 90 minutes for a light load of thin parts. Normal cycles average about two hours—somewhat faster than for hydrogen brazing.

A good braze must be smooth and strong, without graininess or voids. The vacuum method produces smooth fillets of great strength, and photomicrographs (below) show that the braze is without "sugariness" (that is, voids or flux inclusions).

Flexibility

Though the decision to switch to vacuum brazing was based on cost reduction, productivity, and work quality, an additional advantage, says Kenny McDonnell, senior equipment engineer at Bendix, lies in the greater flexibility of the Vacu-Master furnace. Scheduling can easily be adapted to production requirements because there is no need to keep the furnace at full temperature during breaks between heats. Furthermore, the furnace can also be used for annealing, hardening, and sintering.

Experimental work is now being done on heat treating and brazing new high-temperature alloys, and on degassing and treatment of titanium alloys.



High-quality braze . . .
is typical of joints produced in new furnace—strong, smooth, and free of joint-weakening voids or flux inclusions. Photomicrograph, magnification 100X, shows brazed joint between two pieces of stainless steel

Investment in a sound medical program for your plant should yield a handsome return. Small companies can benefit as much as industrial giants

What a medical program can do for you

By D H Robinson, MD

Five years ago six small companies in New England decided to cooperate in a medical program. With some speculation, they entered an agreement to share the expense of a physician, who would administer the program and provide all the services of a modern, well-run occupational health program. Four of these six were metalworking plants.

After three years, they assessed their experiences.

Here's the report of an automotive-parts manufacturer with 250 employees. In the year before the program began, costs to the company for first aid, outside medical care for injuries, and sickness benefits were $38,330.71. (The sickness plan was one covered by insurance that began on the first day of illness.)

After three years of plan operation, one- and two-day absences had fallen precipitously and injuries to men on the job had halved. The cost to the company for all the services and benefits they had paid for the year before the program began, plus their part of the payment for the new medical program, came to only $29,030.30. And costs were rising in these years, don't forget.

Another of the companies, a nationally known manufacturer of fire arms who employs 250 men, also reported that total men off for injury per day had dropped from 4.4 to 2.6. Total man hours lost per month dropped from 12,984 to 7,631.

Still another plant, a malleable-iron foundry employing 100 men, received a 39.5% (or $4800) rebate from its insurance company during the third year of the program.

Big-business myth

The small foundry or metalworking manager usually thinks of the largest companies when someone mentions medical programs. He knows that these industrial giants have such programs. But many occupational-health workers find that the small-plant manager has either unclear or completely erroneous conceptions of what these programs do. And almost universally, the small operator thinks the "bigs" run these programs as a sort of fringe benefit, or because of altruism, or as a tax deductible-operation.

Nothing could be farther from the truth.

Large companies have health programs (preventive medical programs, in contrast to benefit programs and health insurance) because it is good business. These programs show *black* on the books. That's why the big companies have them. Of course, it's not the sole reason, for they have a genuine interest in employees as people, too. But the real justification is the interest the companies have in the people as employees!

A small foundry in California discovered that its labor turnover was sharply reduced, primarily because its people liked to work under the conditions imposed by its new medical-hygiene-safety program. How much do labor turnover and labor replacement cost you? If you found a program that promised to halve this expense, would you investigate it? Medical and safety programs generally halve the labor turnover at plants where they are installed.

Preventive maintenance

A sound medical program can do more than save money (in insurance-rate reductions), reduce lost time (especially short-time illnesses that are open to question), and increase production time per employee. Foremen are pleased that employees can be treated on the premises for minor occupational injuries and on-the-job illness that might otherwise mean many hours of absence. Before a medical program was instituted in a small automotive-hardware plant, employees who were indisposed tended to go home. Now, after a vis-

it to the dispensary, some medication, and rest they usually return to the workbench.

The early detection of physical and, for that matter, mental and emotional illness is *preventive maintenance* of the company's most valuable asset—its people. Chronic "sick complainers" can be helped, too, by careful watching, counseling, and cooperation with their private doctors.

But it is not the intention of this article to go into detail about the parts of any occupational health program. The purpose here is to show what a program can do for you.

Recently, the United States Public Health Service found that if a company spends $8 an employee each year on a health program, the program should yield a return of $12 an employee. In other words, for every $2 a plant spends on an employee's health, it gets back $3.

A really good program costs more than $8 a year! To help those who are considering the installation of a plan in their plants, we have included a table (reproduced to the right). The investment here is $90 a man. The savings have been calculated conservatively. No allowance has been made for the increased production per man due to increased on-the-job time. No notice is made of less turnover. Nor is there allowance for improvements in employee relations or on-the-job counseling and treatment which kept the man at work rather than sent him to his own physician. But, notwithstanding all the omissions on the side of conservatism, the yield of the program is better than 150%.

The number of employees (250) in the table was selected as a good unit. You may interpolate up or down. If you have more men, you actually have less problems and should get a greater yield in dollars and cents than the chart shows. If you have less than 250 workers, you may have more problems, but your yield should not be less.

Many other calculations could be given. The one for your plant is the one you want to consider. Your experience with or without a medical program may be better or worse.

HEALTH AND SAFETY PROGRAM SAVES THE AVERAGE 250-EMPLOYEE PLANT $13,010

PLANT WITHOUT INFLUENCE OF HEALTH AND SAFETY PROGRAM		
Occupational Disease and Injury (One case/20 employees)*		
12 cases/year @ $85.00/case	$ 1,020	
Nonoccupational Disease and Injury (12 days lost/year/employee)**		
3,000 days lost @ $2.50/hour	60,000	
TOTAL COST/YEAR		$61,020
COMPARABLE PLANT WITH HEALTH AND SAFETY PROGRAM		
Occupational Disease and Injury (50% reduction)*		
6 cases/year @ $85.00/case	$ 510	
Nonoccupational Disease and Injury (5 days lost/year/employee)**		
1,250 days lost @ $2.50/hour	25,000	
Subtotal		$25,510
Cost of Health and Safety Program		
Nurse, full time	$5,000	
Safety Engineer, full time	7,000	
Physician, two half-days/week	5,000	
Clerk	3,500	
Space and Equipment	2,000	
Subtotal		22,500
TOTAL COST/YEAR		$48,010

**Adapted from C. O. Sappington*

***California State Health Department Survey (1956)*

Costs per employee

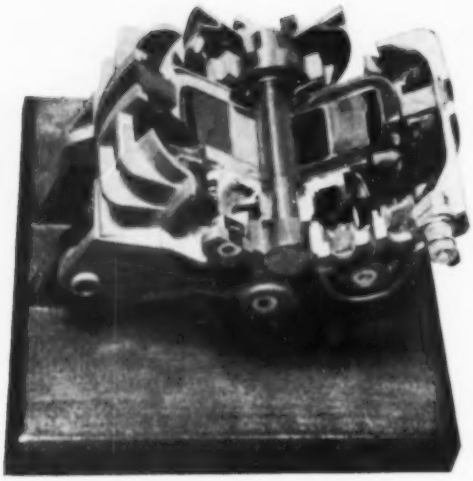
A survey conducted by the Industrial Hygiene Foundation in 1956 revealed that of 279 companies with medical and safety programs, the initial investment for small companies was between $500 and $3000; for medium-sized companies between $5000 and $10,000; and for large companies between $10,000 and $125,000. Monthly upkeep was between $300 and $8000.

Average cost per employee in the companies surveyed was $17.42 yearly, which represented 0.68% of the payroll. In this investigation, the average plant had 1225 employees.

You will see at once that the cost per employee was considerably less than our hypothetical example. This is another point in favor of the conservative estimates—low for yield and high for cost—in our model case. Also, costs have risen a bit since 1956. But savings rise with each added man-day on the job.

It stands to reason that you need competent management of any health program. It stands to reason that some physicians are not interested or trained in industrial health and that some are. Nurses also vary in their effectiveness.

But managers and foremen handle programs of all types with the profit motive in mind. A sound medical program is no exception.



AC alternators . . .
(foreground, right) for Imperial and Valiant cars are assembled on fixtures carried on the 20 pallets of Cimco assembly conveyor (background). Pallets, spaced 24 in. apart, move at timed intervals

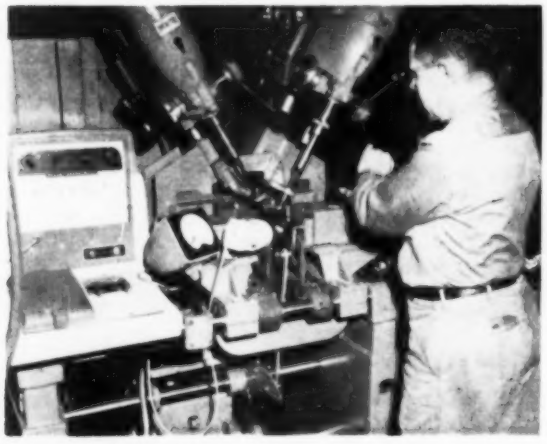
Chrysler rebuilds for new

In less than two years, Chrysler has organized and put into operation an electrical-manufacturing facility. Starting from scratch, company designers and engineers took advantage of latest processing developments. Result: quality units at the lowest possible cost

By Ben C Brosheer, associate editor

AC generators will power electric circuits in the Valiant and Imperial passenger cars offered by Chrysler Corp for 1960. Replacing conventional DC generators, this new equipment not only weighs less, but also has better electrical characteristics. Output curves show that enough

Alternator end shields . . .
are drilled (7 holes) and tapped (3 holes) in automatic-cycle, multi-spindle Natco equipped with three-station table. Separate units machine inboard and outboard parts



Rotors are balanced . . .
dynamically to within ¼ oz-in. on a Gisholt Dynetric balancer. Unit has two drilling spindles that permit manually controlled metal removal

Carbide-tipped tools . . .
in spindles of Ex-Cell-O precision boring machine bore and face two aluminum alternator end shields at a time. Tools turn at 2400 rpm, bore at 0.005 ipr feed, and face at 0.003 ipr

electric equipment

current is generated at engine idling speeds to charge, rather than drain, the car's battery. (The graph at the bottom of this page compares AC alternators and DC generators in this respect.)

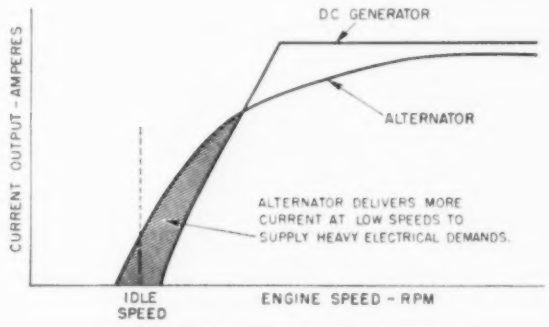
Today rugged, compact Lundell-type alternators, voltage regulators, DC starting motors, and distributors —designed for both 6- and 8-cylinder engines—are being produced at the Chrysler plant in Indianapolis. Until last year, the plant made only PowerFlite automatic transmission and Chrysler power-steering units.

Changeover time was swift. Within less than a year, Chrysler manufacturing and plant engineers rearranged production facilities to make room for alternator, starter, distributor, and voltage-regulator lines. During this period they also procured production units, installed them, and put the lines into production that was large enough to meet scheduled requirements for 1960 models.

Distributors were rolling off the lines seven months after delivery of final product drawings, starter motors within six months, and AC alternators within four months (final alternator design was not determined until last February). But despite the short time, the lines are working efficiently, and they are producing high-quality units at reasonable cost.

Because of the short lead times, conveyors and automatic handling equipment couldn't be installed throughout the four production lines. Automation of production, both to increase capacity to planned levels and to further reduce manufacturing costs, will now go forward rapidly.

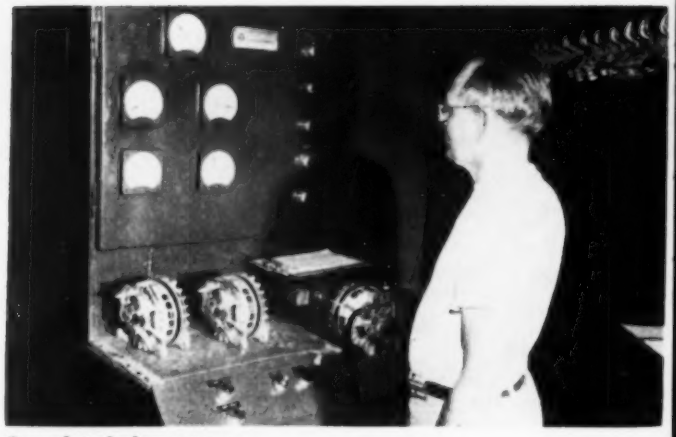
When buying equipment for each production line, planners took advantage of the latest developments in metalforming and machining techniques. To wind coils in the slots of alternator starters, and to produce formed field coils for starter motors, the plant ordered specially designed, automatic units from Globe Tod & Engineering Co. Starter-clutch housings are being produced in one of the first Intra-Form ma-


DC GENERATOR
ALTERNATOR
CURRENT OUTPUT - AMPERES
ALTERNATOR DELIVERS MORE CURRENT AT LOW SPEEDS TO SUPPLY HEAVY ELECTRICAL DEMANDS.
IDLE SPEED
ENGINE SPEED - RPM

OUTPUT-ALTERNATOR vs DC GENERATOR

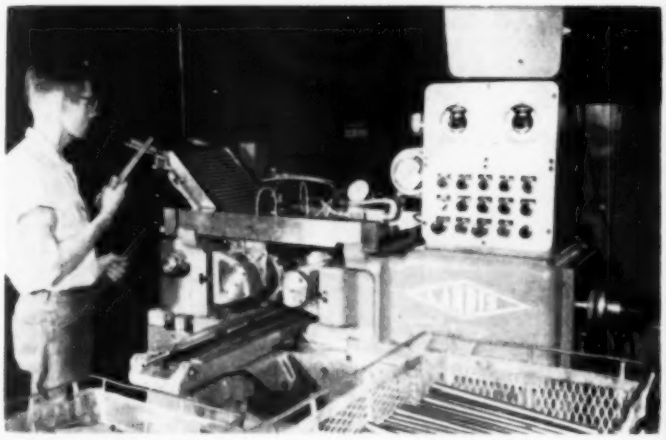
Output characteristics . . .
of AC alternator provide current for battery charging or car operation at much slower speed than does conventional DC generator. Current at idling speed supplies operating needs under many driving situations

Three silicon rectifiers . . .
are assembled into aluminum end shield in this Denison hydraulic Multipress. Pins supported above fixture on Diedraulic grip cylinders hold the rectifiers



Completed alternators . . .
get electrical tests at 1500 and 2500 rpm on this special Christensen test stand, prior to shipment to auto assembly plants. Other special test stands check completed starter motors and distributors

Rotor pole pieces . . .
are cupped in a 200-ton Danly press and coined to shape in a 100-ton, 10-in.-stroke Danly OBI press. This minimizes machining needed to hold air gap between rotor and stator during assembly



Cold-forming machines . . .
(Landis Lan-Hy-Rol) knurl alternator rotor shafts and roll (above) helical-clutch-drive splines on starter-motor shafts. Production is 500 to 600 an hour. Sulfurized oil lubricates rolls

chines of Cincinnati Milling & Grinding Machine Co. To make starter-motor frames, engineers have devised new procedures. Other innovations appear in accompanying photographs.

Rectifiers in Alternators

Output of the alternators is direct current; a feature of their design is full-wave rectification with six silicon diodes (rectifiers). A positive and a negative diode are permanently connected into each of the three phases.

Completed, the alternators (15-v, 35-amp) are $4\frac{1}{2}$ in. long, have a $6\frac{5}{8}$ in. OD, and weigh only 13 lb. The conventional DC automotive generator, with an OD of $4\frac{1}{2}$ in., weighs 23 lb.

Basically, alternator design is similar to that of the Lundell-type alternator Chrysler has for some years purchased for heavy-duty applications. This familiar design aided product engineers in their development work before they released designs to manufacturing engineers in Indianapolis. At the same time, manufacturing engineers could select some equipment before final design decisions were made.

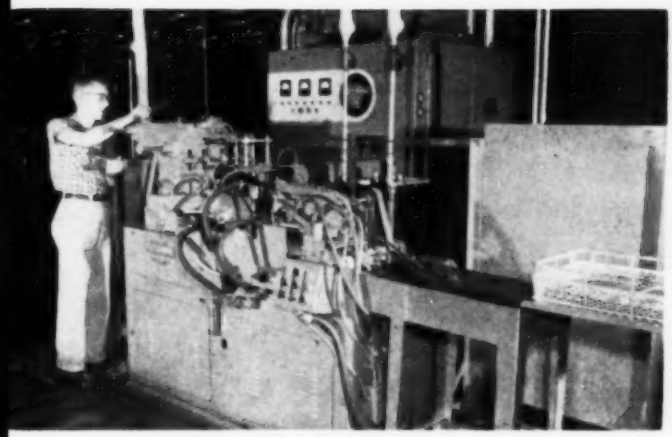
Carefully selected low-carbon steel is the material for stator laminations, rotor cores, and pole pieces. Rotor collector (slip) rings are a copper stamping, molded into glass-filled alkyd plastic, and then separated when the brush surfaces are machined.

Starters and Distributors

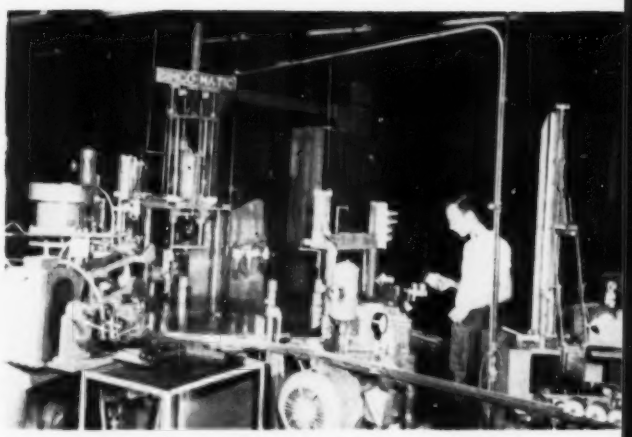
Although starter motors, distributors, and voltage regulators basically are like those in most automobiles, a number of material innovations have been worked into their designs. For example, the 6- and 8-cylinder distributors contain sintered-metal weights and nylon gears; clutch housings in the starter motors are cold-formed steel. To minimize machining of starter-motor frames, welded rings are cold-sized in a novel setup.

In the lines that produce starter motors and distributors, a number of automatic machines require an operator's attention only at infrequent intervals. All he has to do is keep parts hoppers filled. When the lines are more completely automated, other operations will need only occasional attention.

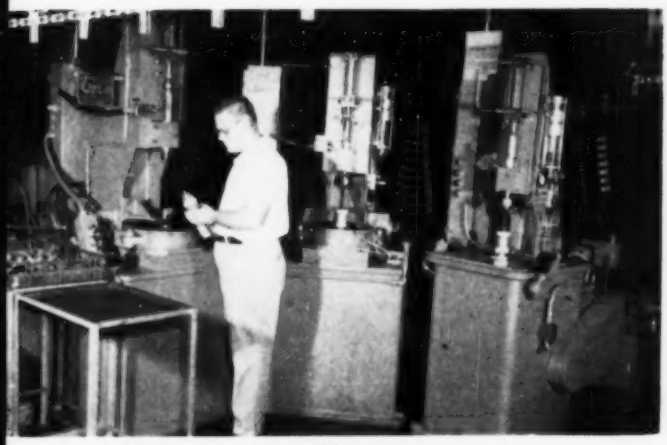
(For a more detailed picture of Chrysler's manufacturing techniques in the new setup, see the photographs that accompany this article.)



Induction hardening unit . . .
hardens, quenches, and draws to 40-46 R_C two $1\frac{1}{2}$-in.-long bearing diameters at ends of AISI 1144 steel starter-motor shafts. Unit is an automatic 30-kw, 250-cycle Ther-Monic heater

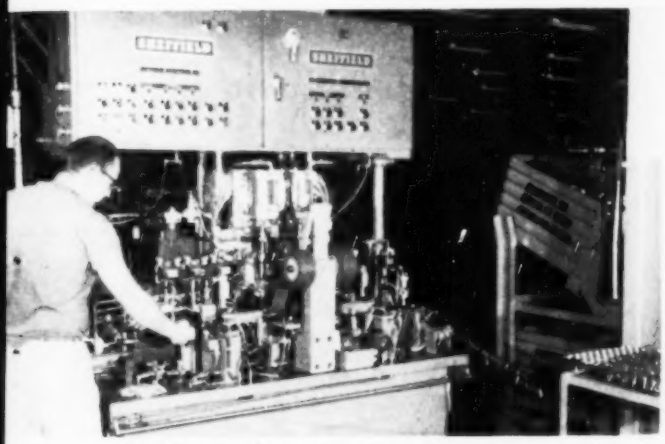


Armature assembly machine . . .
is a special Cimco unit. Shafts feed from magazine for automatic assembly into premeasured stacks of laminations to form starter-motor armature. Finished armatures then are demagnetized



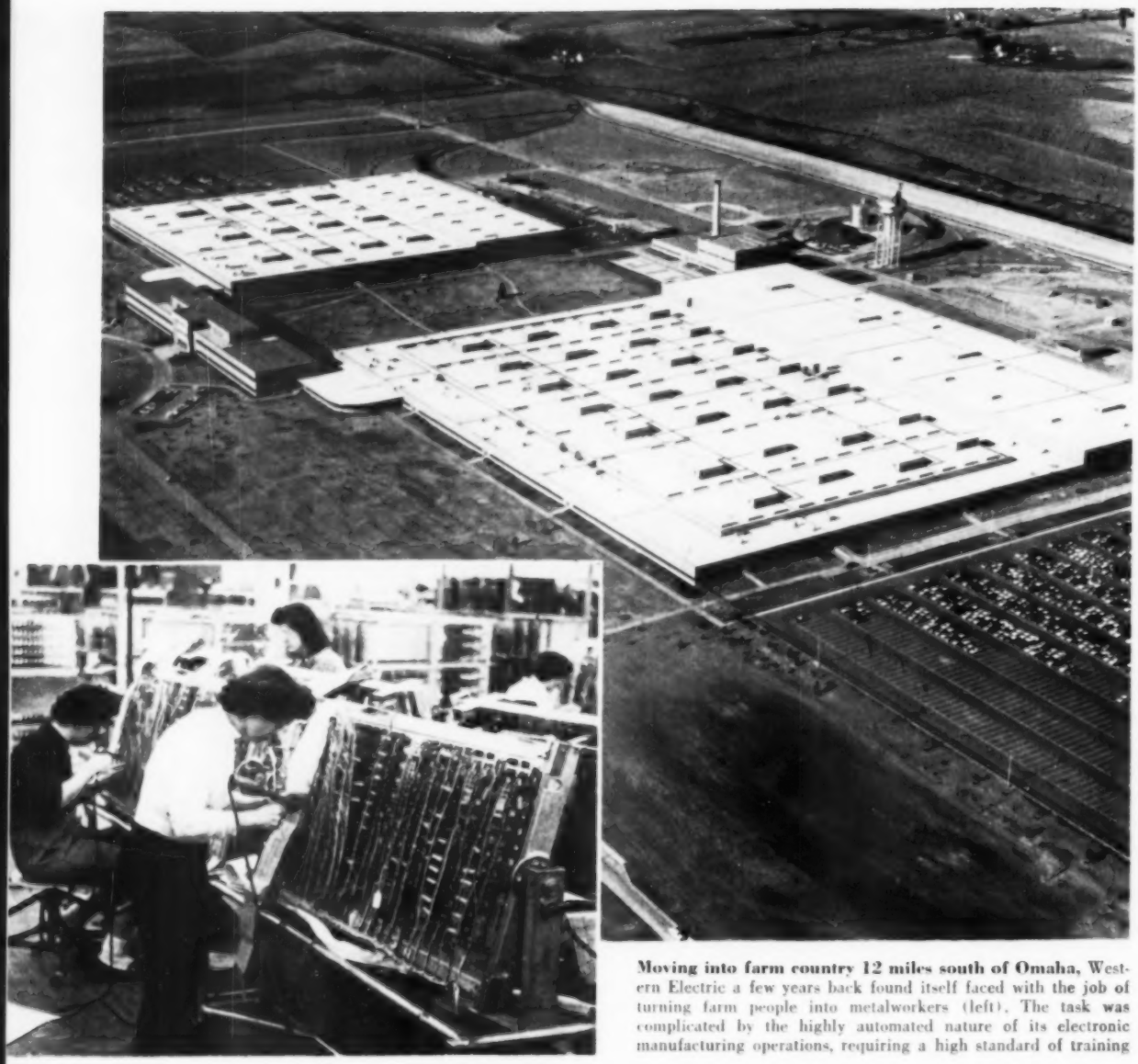
Commutator assembly group . . .
consists of three special Trio units that form coil ends of starter-motor armature, then connect them to slotted bars of commutator assembled to armature shaft. Connections later are soldered, armatures varnished and baked automatically

Starter motors . . .
are assembled in fixtures carried on 26 pallets (spaced on 48-in. centers) in this CEC conveyorized table. Conveyor will run continuously or move intermittently. Finished units move to nearby test stands



Diaphragms for vacuum control . . .
of distributors are automatically assembled in this special Sheffield machine, which operates at about 600 cycles an hour. Hoppers and magazines feed actuators for attachment to diaphragm

Mounting brackets . . .
are welded to distributor vacuum-control inner cups in this Federal projection welder. Table fixtures use ceramic (cemented-oxide) blocks. Production is about 500 an hour



Moving into farm country 12 miles south of Omaha, Western Electric a few years back found itself faced with the job of turning farm people into metalworkers (left). The task was complicated by the highly automated nature of its electronic manufacturing operations, requiring a high standard of training

Western Electric-Omaha prides itself on apprentice-to-executive . . .

Worker training in a rural area

Going in cold into a rural area with a new plant is a job facing many companies in this era of rapid expansion and dispersal of industry. And it is a problem that will become more acute and occur more and more frequently as time goes on.

Not only does such a move involve the physical setting-up of new plant and equipment, but the even knottier task of educating a primarily unmechanical people in the intricacies of industrial production. In essence, it means building a competent industrial workforce from green farm people.

Western Electric Co, setting up its huge 1,800,000-sq-ft wire and cable plant in farmlands 12 miles south of Omaha, found its personnel recruiting and training needs complicated by the fact that the plant would be largely automated and would require a more-than-usually-skilled workforce. Fortunately, Omaha's personnel and training people were backed by the company's more than 50 years' experience in training workers—from custodial employees through top management.

Before starting up production in May of 1958, Western Electric-Omaha found it necessary to hire 90% of its 3000 workers locally, from an area woefully lacking in mechanically trained people. Orientation programs began immediately, along with apprentice training, supervisory training and on-the-job instruction. Local-

ly hired engineers and supervisors were sent to other Western Electric installations for special training.

In dire straits for toolmakers and machinists, the plant set up its apprentice training courses for those two trades in October 1956, long before production started, with the result that the first toolmaker was graduated in October 1958 and its first machinist in May 1959. The program was and is approved by the Veterans Administration for the G I Bill.

The apprentice at Western Electric is not indentured. He receives a formal period of training (including on-the-job training), plus 20 hours a week of classroom instruction. The Omaha plant has eight full-time instructors, who are given films and other visual aids, the best possible textbooks (Western Electric has even prepared its own texts when it thought existing ones were inadequate) to assist in instruction in mathematics, shop theory, drawing.

Started with 81 apprentices

The Omaha plant began its training program with 81 apprentices, ranging in age from 18 to 36 (average age: 23). Some were just out of high school, a few had some work experience. Candidates from 24 Nebraska towns were required to pass the Otis Test, the Minnesota Paper Book Form, the Purdue Industrial Training Classification Test, and Western Electric's own Electric Mechanical Ability Test. Together, the four tests measure intelligence, mechanical aptitude, arithmetical ability and general knowledge of science.

Apprentice courses are given at Omaha in toolmaking (50 apprentices) and machining (31 apprentices). Both are three-and-a-half year courses, with credit given for previous experience.

Moneywise, training is divided into nine periods, and the apprentice advances from one stage to another commensurate with his knowledge and ability. He begins at $1.51 an hour, is advanced to $1.56, $1.62, $1.69, $1.76, $1.84, $1.93, $2.04, $2.18, and finally to a starting journeyman wage of $2.33. The apprentice buys his own tools. At the conclusion of his training he is assured of a job with Western Electric.

Each trainee is rated by the instructor on the quality and quantity of his work, his ability and job attitude. Ratings are noted on weekly report cards, which the trainee receives, and can have a speedup or slowing effect on length of training.

More than 80 apprentices (machinist and toolmaker) are in training at Western Electric-Omaha

Ray Jahnke (left) chief of Omaha's Tool & Machine Training Section, checks a die yoke layout with John Eledge, first apprentice to complete the toolmaker course. Also in photo are apprentices Garry Kahler, Jack Thraen, and Darrel Yenney, all working on lathes. Apprentices start their 3-½-year course at $1.51 an hour, work up to beginning journeyman wage of $2.33.

Apprentices Dave Johnson, LeRoy Roth and Gary Krahmer at work in the Omaha plant's Die Laboratory. Plant's Bureau of Apprenticeship-approved toolmaker course takes 3½ years, currently has 50 trainees.

In just two years, Western Electric has taught electronics

Emily Sinkule, stamping

Ruth Billman, surface wiring

First toolmaker to graduate (in October 1958) from the Omaha plant's course was John W Eledge, who had had 12 years' machine shop experience, eight of them with railroads, before coming to Western Electric. "In my experience," he says, "I have never seen an apprentice course that compares with Western Electric's."

For other workers, training begins with four hours of orientation, in which the new employee is made familiar with the history of the company, its organization and structure, and with the work of the Omaha plant. During these talks employees are told of company policy regarding job grading, pay structure, rotation and upgrading, safety practice, paid holidays, vacations, other benefits.

Newly hired employees whose education, background and potential makes them of management caliber are given a two weeks' orientation course at Western Electric's Hawthorne Works in Chicago. Here, the course emphasizes company policy, functions and cooperation.

Newly promoted supervisors go to the company training center in Chicago for an eight-hour-day three-week course on human relations and dealing with employees. During this time, "students" visit other company plants, attend seminars, and discuss case studies.

They are taught especially how to listen to employees' problems and how to encourage a worker to "talk out" his troubles.

On-the-job skill improvement of workers is less formal. Here, supervisors are required to teach workers their jobs, to follow through and see that the job is done correctly, and to assist the worker in upgrading himself. Journeymen, for example, are encouraged to take outside course that will assist in their upgrading. The company also from time to time establishes short-term training programs of its own.

Supervisor recruiting, training

At its inception, the Omaha plant had a pressing need for adequately trained supervisors. Too few people of such potential were on the payrolls, and candidates had to be recruited from college graduates and from highly qualified job applicants. Fifteen were chosen for special training after careful selection and consultation with the line organization, personnel department and top management people.

The 15 candidates each received a full year of on-the-job training: six weeks' study of employment and placement methods, two months on quality control and inspection, two months on operations, and two months on production control and works service. After 10 months of training, each candidate was given two months' specialized training in the field for which the company believed him to be best suited.

Though this method was designed to provide first-line supervisors, participants were not guaranteed that such a position would be open to them at the conclusion of training, only that they would be a source of supply for such jobs. However, of the 15 men completing training in the fall of 1958, 10 are now in supervisory jobs and five are in key positions where they are receiving further special training for placement in supervisory jobs when openings occur.

Engineer recruiting has been a thorny problem for all industry in recent years, and recruiting for the Omaha plant hasn't been an exception. Western Electric as a whole employs 5000 of them, the Omaha plant 150, primarily plant and product engineers.

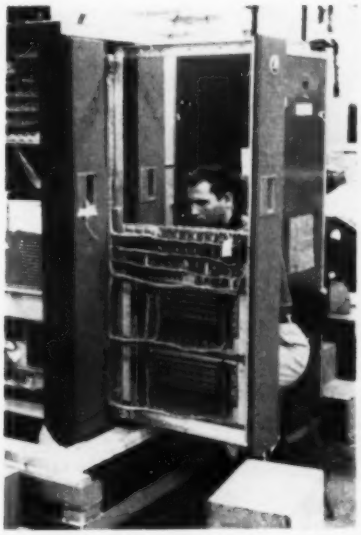
In June 1957, Western Electric set up a formal in-company Graduate Engineering Training Program designed to provide advanced training for new and veteran engineers.

Idea has been to increase the capabilities of the company's engineering staff by providing a smooth transition from academic learning to career development in industry, thus bringing the new engineer to full productivity in the shortest possible time. Too, the program stimulates creativity, broadens the engineer's understanding of his function in the company.

manufacturing skills to a predominantly rural population

Allen Schwab, cable forming

June Anderson, connector wiring



Charley Maly, testing

The courses are designed to challenge and stimulate as well as to inform, and they thus require high standards of performance from the student and the instructor, particularly since the highly flexible program is geared to latest advances in technology.

Class lectures and discussions are supplemented by laboratory experiments, practical demonstration and study. Separate classes are provided for manufacturing and distributing, radio, equipment and installation, and plant.

The program is conducted at company expense on a full-time, off-the-job basis at Western Electric's Training Centers in Chicago, New York, and Winston-Salem, N C, and on campuses of cooperating universities in the summer. The three phases: introduction to Western Electric engineering, general development, and advanced development.

Orienting new engineers

Introductory courses are given new engineers shortly after they join the company, at one of three training centers, last nine weeks. Upon completion of the introductory course, the new engineer returns to his job for six to eight months, then goes back to the training center for a second nine-week course, known as the General Development phase.

After that comes the Advanced Development program, designed for those who have completed the first two courses, and for experienced engineers. Its courses are various, usually take four weeks, and cover both theory and practice. The curriculum is directed toward promoting the skills needed to meet short and long-range engineering objectives. Participation in advanced courses is on a selective basis. As a rule, no participating engineer may take more than four weeks of such courses a year.

Omaha employees who show promise of becoming management or supervisory material are encouraged by the company to apply for a tuition grant (maximum $250 a year paid by the company) at nearby approved colleges. The company prefers that such courses be related to the applicant's job, also stipulates that such courses must be taken on the employee's own time, and that the employee must pay for books and lab fees. Western Electric also insists that the employee's supervisor approve such an application only after satisfying himself that the worker is not only capable of college level work, but will achieve above-average performance.

Some 60 Omaha workers are now participating in this program. They include hourly, salaried and supervisory personnel. Most of them are taking isolated courses at night at the University of Omaha or Creighton University.

Realizing that quality cannot be inspected into a product, Western Electric five years ago instituted a company-wide quality control program to cut defects—a program which places responsibility for quality with each operator. To accomplish this, it was necessary for every engineer, supervisor and worker on the line to know its principles.

Today, Omaha has 50 workers taking hour-long classes (four are held a day in company classrooms on company time), and some 700 other workers have already completed training in how to achieve greater production with fewer product defects. The course consists of three one-hour classes.

Quality control courses

For supervisors, engineers and other key people, Omaha has set up a 24-hour course in quality control, broken up into 2-hour classes. Currently, the plant has five such classes, attended by 85 people. Several hundred have already completed the course. These upperlevel courses are also held in company classrooms on company time, concentrate on use of such visual aids as charts and demonstrations of sampling plans and on such techniques as capability studies.

Worker safety is of prime importance at Western Electric-Omaha, as witness signs throughout the plant: "Always alert, nobody hurt."

Class in quality appreciation, taught by D L Van de Water, is one of four held daily. Course for workers consists of three one-hour classes, for key personnel 12 two-hour classes

Each supervisor is responsible for safety indoctrination of his workers —must see that they wear safety glasses when needed, and must show them the proper way to lift heavy objects without causing strain. The plant's Safety Store provides free safety glasses, prescription ones if the employee wears eyeglasses. Safety shoes may be purchased at cost.

Four-month-long safety contests, are conducted in all departments, which are either classified as "high exposure to unsafe conditions" or "low exposure to unsafe conditions." Areas with completely automated machines fall into the latter category, while those with mostly manually operated machines fall into the former. These contests are based on a demerit system, and at the conclusion of four months winning teams are selected in the two categories, with each employee on the winning team receiving a prize.

During the contest, safety observers are selected from the employees themselves. Once a month, observers attend a class on safe working conditions, unsafe acts, and good housekeeping.

Each week, a safety inspection committee makes a tour of the entire plant. The committee is made up of two safety advisors, a department chief, plant inspector and a safety observer from each area. Many departments voluntarily set up their own safety teams as need arises.

The Omaha plant also provides intensive training for operators of its 120 electrically powered industrial trucks. Drivers are carefully selected from the ranks, must pass a special physical examination, and are trained in general safety rules as well as safe operating procedures for their vehicles.

Drivers are given six hours of classroom instruction, then must pass an obstacle course test. After this they take on-the-job training for two weeks, during which time they are observed carefully by their supervisors. If they qualify, they are given a final test, and finally a license, which is a badge that must be worn at all times.

Polaroid camera safety check

Safety training does not stop with the driver's acquisition of a license —Plant Safety Director Harold E Wheelock keeps a constant check by taking polaroid pictures of unsafe practices: bad loading of a truck, skid marks where a driver cuts a corner too close in the well-marked pedestrian aisles, "cowboy" driving, etc.

From time to time films on safety are shown to first line supervisors, and there are special safety courses for layout operators, punch courses operators and drillpress operators. To insure that its workers have every protection, Omaha has a doctor and nurse on duty full time, and an ambulance is available at all times.

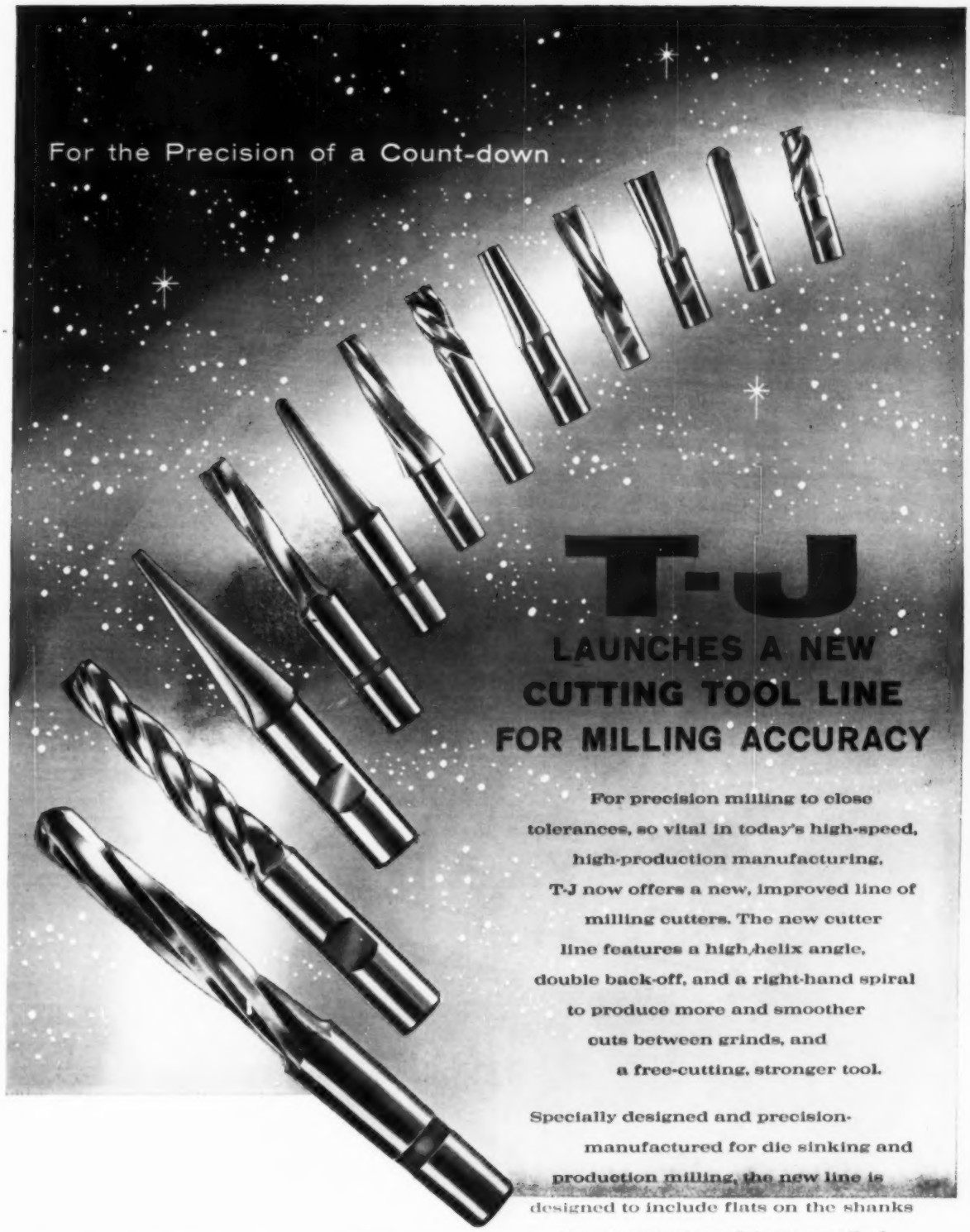
Civil defense training gets full attention at Western Electric-Omaha. The two prime objectives: employee protection and protection of physical property.

In line with these objectives, employees receive on-the-job training on what to do in the event of an enemy attack, or if a disaster such as flood or tornado hits. Instruction in first aid is also given on company time.

The plant has a warden organization to see that employees are directed to proper shelter areas, and first aid crews are stationed throughout the plant at strategic spots. Each crew has one person thoroughly trained in first aid.

Western Electric-Omaha has set up the first radiological monitoring team in Nebraska. This 17-member, plant-wide crew is instructed by an employee who attended the US Government Instruction Center in Kansas City. The group began with eight two-hour classes, now keeps up to date with classes once a month.

Plant rescue squads are instructed to free trapped people first in the event of any disaster. The company maintains a manned fire truck and has fire-fighting crews throughout the plant. There are also guards and a police detail responsible for evacuating the plant in case of emergency.



T-J

LAUNCHES A NEW CUTTING TOOL LINE FOR MILLING ACCURACY

For precision milling to close tolerances, so vital in today's high-speed, high-production manufacturing, T-J now offers a new, improved line of milling cutters. The new cutter line features a high helix angle, double back-off, and a right-hand spiral to produce more and smoother cuts between grinds, and a free-cutting, stronger tool.

Specially designed and precision-manufactured for die sinking and production milling, the new line is designed to include flats on the shanks for set screw type drivers on all of the end and side milling cutters.

Write today for complete information to the Tomkins-Johnson Company, Jackson, Mich.

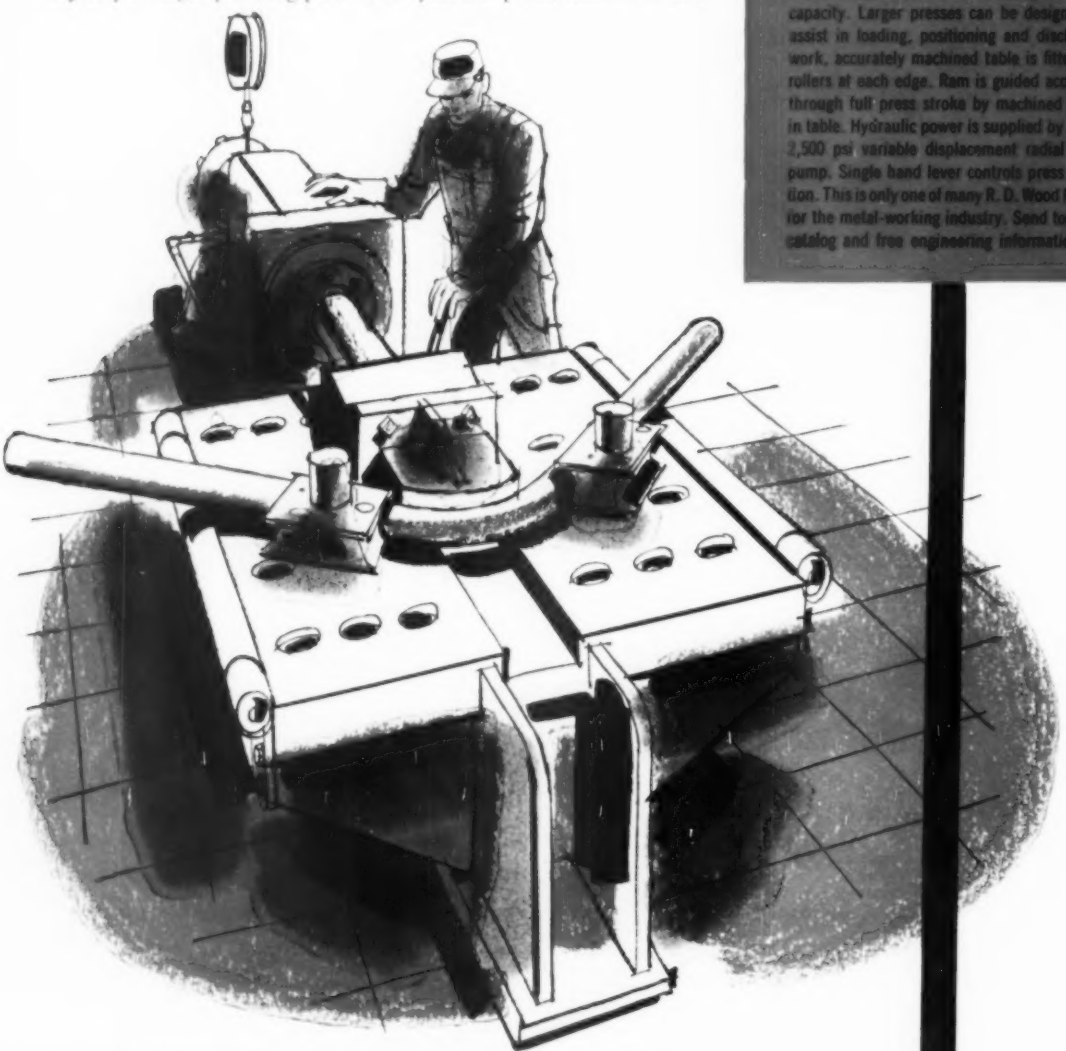
Ask for completely new cutter catalogue No. 259.

T-J TOMKINS-JOHNSON

How to save money on your next press: apply your specs to a basic R. D. Wood design

The result will be exactly *what you want*—just as surely as if you had it designed from scratch. And its cost will be much lower. Working with numerous basic models, R. D. Wood engineers can save considerable design time and expense, and still incorporate *your* specifications in the finished machine. You're sure of its quality, too. For every Wood Press is built by experts using selected materials. This brings additional saving from smooth, dependable performance; fast, economical production; trouble-free operation. *Before* you begin planning your next hydraulic press, consult Wood.

R. D. Wood 25 ton capacity, heavy-duty horizontal press for cold bending steel or copper pipes and tubes. Handles 1½, 2, 2½, 3, 3½, and 4" sizes with standard bending pins, forms and dies. Other sizes are available up to 200 tons capacity. Larger presses can be designed. To assist in loading, positioning and discharging work, accurately machined table is fitted with rollers at each edge. Ram is guided accurately through full press stroke by machined groove in table. Hydraulic power is supplied by 3 gpm, 2,500 psi variable displacement radial piston pump. Single hand lever controls press operation. This is only one of many R. D. Wood Presses for the metal-working industry. Send today for catalog and free engineering information.



R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA

Temperature Corrections for Dimensions – IV

By H K Eitelman, ordnance department, General Electric Co, Pittsfield, Mass

(See AM–Oct 5 '59, p 113 for explanations)

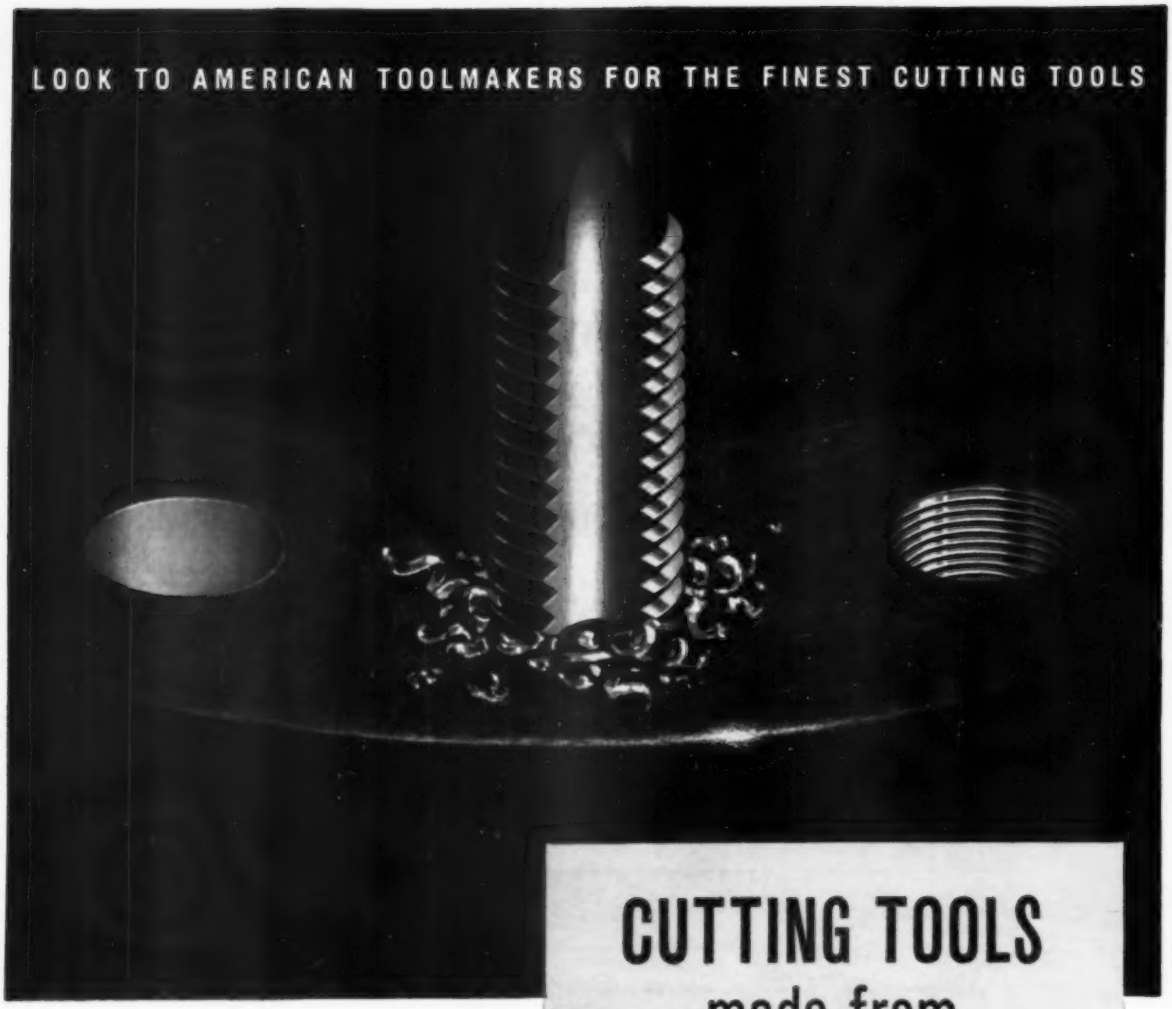
Aluminum

Temp	Correction Factors for Dimensions .5-1.49	1.5-2.49	2.5-3.49	3.5-4.49	4.5-5.49
69	0.000012	0.000025	0.000037	0.000049	0.000062
70	0.000025	0.000049	0.000074	0.000099	0.000123
71	0.000037	0.000074	0.000111	0.000148	0.000185
72	0.000049	0.000099	0.000148	0.000197	0.000247
73	0.000062	0.000123	0.000185	0.000247	0.000309
74	0.000074	0.000148	0.000222	0.000296	0.000370
75	0.000086	0.000173	0.000259	0.000346	0.000432
76	0.000099	0.000197	0.000296	0.000395	0.000494
77	0.000111	0.000222	0.000333	0.000444	0.000555
78	0.000123	0.000247	0.000370	0.000494	0.000617
79	0.000136	0.000271	0.000407	0.000543	0.000679
80	0.000148	0.000296	0.000444	0.000592	0.000740
81	0.000160	0.000321	0.000481	0.000642	0.000802
82	0.000173	0.000346	0.000518	0.000691	0.000864
83	0.000185	0.000370	0.000555	0.000740	0.000926
84	0.000197	0.000394	0.000592	0.000790	0.000987
85	0.000210	0.000420	0.000629	0.000839	0.001049
86	0.000222	0.000444	0.000666	0.000888	0.001111
87	0.000234	0.000469	0.000703	0.000938	0.001172
88	0.000247	0.000494	0.000740	0.000987	0.001234
89	0.000259	0.000518	0.000777	0.001037	0.001296
90	0.000271	0.000543	0.000814	0.001086	0.001357

Aluminum

Temp	Correction Factors for Dimensions 5.5-6.49	6.5-7.49	7.5-8.49	8.5-9.49	9.5-10.49
69	0.000074	0.000086	0.000099	0.000111	0.000123
70	0.000148	0.000173	0.000197	0.000222	0.000247
71	0.000221	0.000259	0.000296	0.000333	0.000370
72	0.000296	0.000346	0.000395	0.000444	0.000494
73	0.000370	0.000432	0.000494	0.000555	0.000617
74	0.000444	0.000518	0.000592	0.000666	0.000740
75	0.000518	0.000605	0.000691	0.000777	0.000864
76	0.000592	0.000691	0.000790	0.000888	0.000987
77	0.000666	0.000777	0.000888	0.001000	0.001111
78	0.000740	0.000864	0.000987	0.001111	0.001234
79	0.000814	0.000950	0.001086	0.001222	0.001357
80	0.000888	0.001037	0.001185	0.001333	0.001481
81	0.000963	0.001123	0.001283	0.001444	0.001604
82	0.001037	0.001209	0.001382	0.001555	0.001728
83	0.001111	0.001296	0.001481	0.001666	0.001851
84	0.001185	0.001382	0.001580	0.001777	0.001974
85	0.001259	0.001468	0.001678	0.001888	0.002098
86	0.001333	0.001555	0.001777	0.001999	0.002221
87	0.001407	0.001641	0.001876	0.002110	0.002345
88	0.001481	0.001728	0.001974	0.002221	0.002468
89	0.001555	0.001814	0.002073	0.002332	0.002591
90	0.001629	0.001900	0.002172	0.002443	0.002715

LOOK TO AMERICAN TOOLMAKERS FOR THE FINEST CUTTING TOOLS



CUTTING TOOLS made from HIGH SPEED STEELS *are Better Than Ever*

Today's high speed steel tools for tapping, drilling, milling, broaching, reaming, sawing and other metal cutting operations are better than ever. Through research and development, and new and better production methods, American toolmakers are constantly improving high speed steel tools to help you make better products . . . at less cost.

As a leading producer of high speed and other specialty steels, Universal-Cyclops continues to aid your toolmaker's efforts with its own aggressive research and development program.

Look to your American toolmaker for the finest in high speed steel cutting tools!

UNIVERSAL CYCLOPS
STEEL CORPORATION
BRIDGEVILLE, PA.

TOOL STEELS • STAINLESS STEELS • HIGH TEMPERATURE METALS

Temperature Corrections for Dimensions – V

Aluminum

Correction Factors for Dimensions

Temp	10.5-11.49	11.5-12.49	12.5-13.49	13.5-14.49	14.5-15.49
69	0.000136	0.000148	0.000160	0.000173	0.000185
70	0.000271	0.000296	0.000328	0.000346	0.000370
71	0.000407	0.000444	0.000492	0.000518	0.000555
72	0.000543	0.000592	0.000656	0.000691	0.000740
73	0.000679	0.000740	0.000820	0.000864	0.000926
74	0.000814	0.000888	0.000984	0.001037	0.001111
75	0.000950	0.001037	0.001148	0.001209	0.001296
76	0.001086	0.001185	0.001312	0.001382	0.001481
77	0.001222	0.001333	0.001476	0.001555	0.001666
78	0.001357	0.001481	0.001640	0.001728	0.001851
79	0.001493	0.001629	0.001804	0.001900	0.002036
80	0.001629	0.001777	0.001968	0.002073	0.002221
81	0.001765	0.001925	0.002132	0.002246	0.002406
82	0.001900	0.002073	0.002296	0.002419	0.002591
83	0.002036	0.002221	0.002460	0.002591	0.002777
84	0.002172	0.002369	0.002624	0.002764	0.002962
85	0.002308	0.002517	0.002788	0.002937	0.003147
86	0.002443	0.002665	0.002952	0.003110	0.003332
87	0.002579	0.002814	0.003116	0.003282	0.003517
88	0.002715	0.002962	0.003280	0.003455	0.003702
89	0.002851	0.003110	0.003444	0.003628	0.003887
90	0.002986	0.003258,	0.003608	0.003801	0.004072

Aluminum

Correction Factors for Dimensions

Temp	15.5-16.49	16.5-17.49	17.5-18.49	18.5-19.49	19.5-20.49
69	0.000197	0.000210	0.000222	0.000234	0.000247
70	0.000395	0.000420	0.000444	0.000469	0.000494
71	0.000592	0.000629	0.000666	0.000703	0.000740
72	0.000790	0.000839	0.000888	0.000938	0.000987
73	0.000987	0.001049	0.001111	0.001172	0.001234
74	0.001185	0.001259	0.001333	0.001407	0.001481
75	0.001382	0.001468	0.001555	0.001641	0.001728
76	0.001580	0.001678	0.001777	0.001876	0.001974
77	0.001777	0.001888	0.001999	0.002110	0.002221
78	0.001974	0.002098	0.002221	0.002345	0.002468
79	0.002172	0.002308	0.002443	0.002579	0.002715
80	0.002369	0.002517	0.002665	0.002814	0.002962
81	0.002567	0.002727	0.002888	0.003048	0.003208
82	0.002764	0.002937	0.003110	0.003282	0.003455
83	0.002962	0.003147	0.003332	0.003517	0.003702
84	0.003159	0.003356	0.003554	0.003751	0.003949
85	0.003356	0.003566	0.003776	0.003986	0.004196
86	0.003554	0.003776	0.003998	0.004220	0.004442
87	0.003751	0.003986	0.004220	0.004455	0.004689
88	0.003949	0.004196	0.004442	0.004689	0.004936
89	0.004146	0.004405	0.004665	0.004924	0.005183
90	0.004344	0.004615	0.004887	0.005158	0.005430

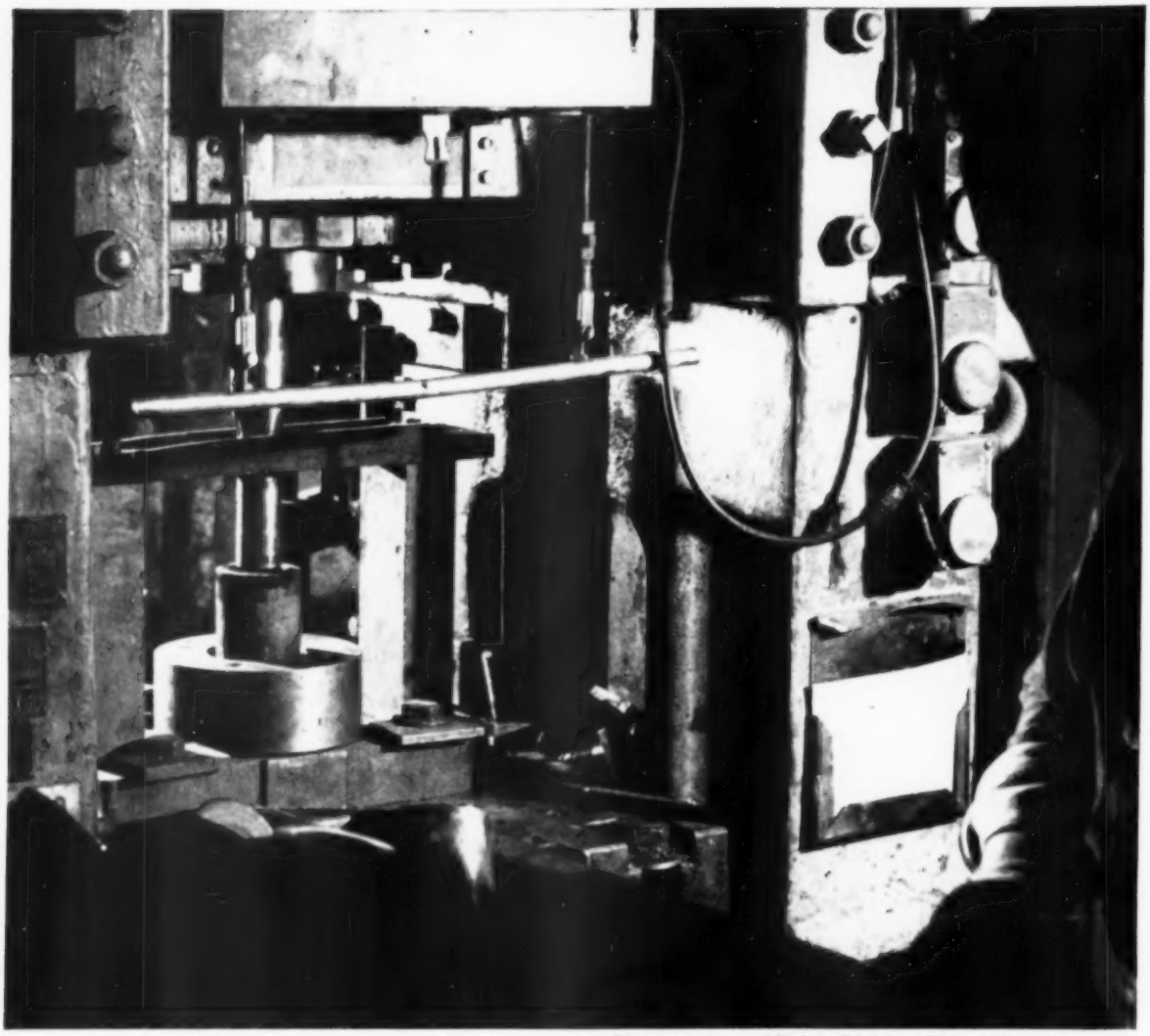


Photo courtesy of Heintz Division, Kelsey Hayes Company

HIGH PRODUCTION cold extruding proof of Aristoloy uniform quality

High-speed production of cold extruded parts like this track link bushing for a midwest equipment manufacturer can not tolerate variations in quality. Physical and chemical uniformity are all-important if costs are to be kept in line and rejects eliminated.

Aristoloy 8620 electric furnace steel meets the high quality requirements of Heintz Division of Kelsey Hayes Company and its customers.

From the melt shop to rolling and finishing operations, careful control guarantees that delivered bars will meet the most rigid standards of quality.

For complete information about Aristoloy leaded or standard carbon, alloy and stainless grades, call the Copperweld representative in your nearest large city. Or write today for NEW PRODUCTS & FACILITIES CATALOG.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4009 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

Temperature Corrections for Dimensions – VI

Aluminum

Temp	Correction Factors for Dimensions					
	20.5-21.49	21.5-22.49	22.5-23.49	23.5-24.49	24.5-25.49	
69	0.000259	0.000271	0.000284	0.000296	0.000309	
70	0.000518	0.000543	0.000568	0.000592	0.000617	
71	0.000777	0.000814	0.000851	0.000888	0.000926	
72	0.001037	0.001086	0.001135	0.001185	0.001234	
73	0.001296	0.001357	0.001419	0.001481	0.001543	
74	0.001555	0.001629	0.001703	0.001777	0.001851	
75	0.001814	0.001900	0.001987	0.002073	0.002160	
76	0.002073	0.002172	0.002271	0.002369	0.002468	
77	0.002332	0.002443	0.002554	0.002665	0.002777	
78	0.002591	0.002715	0.002838	0.002962	0.003085	
79	0.002851	0.002986	0.003122	0.003258	0.003394	
80	0.003110	0.003258	0.003406	0.003554	0.003702	
81	0.003369	0.003529	0.003690	0.003850	0.004011	
82	0.003628	0.003801	0.003973	0.004146	0.004319	
83	0.003887	0.004072	0.004257	0.004442	0.004628	
84	0.004146	0.004344	0.004541	0.004739	0.004936	
85	0.004405	0.004615	0.004825	0.005035	0.005245	
86	0.004665	0.004887	0.005109	0.005331	0.005553	
87	0.004924	0.005158	0.005393	0.005627	0.005862	
88	0.005183	0.005430	0.005676	0.005923	0.006170	
89	0.005442	0.005701	0.005960	0.006219	0.006479	
90	0.005701	0.005973	0.006244	0.006516	0.006787	

Aluminum

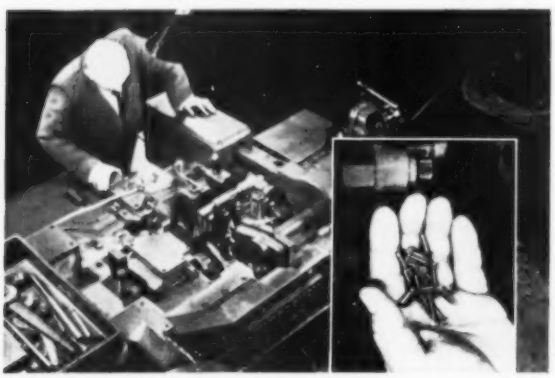
Temp	Correction Factors for Dimensions					
	25.5-26.49	26.5-27.49	27.5-28.49	28.5-29.49	29.5-30.49	
69	0.000321	0.000333	0.000346	0.000358	0.000370	
70	0.000642	0.000666	0.000691	0.000716	0.000740	
71	0.000963	0.001000	0.001037	0.001074	0.001111	
72	0.001283	0.001333	0.001382	0.001431	0.001481	
73	0.001604	0.001666	0.001728	0.001789	0.001851	
74	0.001925	0.001999	0.002073	0.002147	0.002221	
75	0.002246	0.002332	0.002419	0.002505	0.002591	
76	0.002567	0.002665	0.002764	0.002863	0.002962	
77	0.002888	0.002999	0.003110	0.003221	0.003332	
78	0.003208	0.003332	0.003455	0.003579	0.003702	
79	0.003529	0.003665	0.003801	0.003936	0.004072	
80	0.003850	0.003998	0.004146	0.004294	0.004442	
81	0.004171	0.004331	0.004492	0.004652	0.004813	
82	0.004492	0.004665	0.004837	0.005010	0.005183	
83	0.004813	0.004998	0.005183	0.005368	0.005553	
84	0.005133	0.005331	0.005528	0.005726	0.005923	
85	0.005454	0.005664	0.005874	0.006084	0.006293	
86	0.005775	0.005997	0.006219	0.006441	0.006664	
87	0.006096	0.006330	0.006565	0.006799	0.007034	
88	0.006417	0.006664	0.006910	0.007157	0.007404	
89	0.006738	0.006997	0.007256	0.007515	0.007774	
90	0.007058	0.007330	0.007601	0.007873	0.008144	

Which picture do you fit?

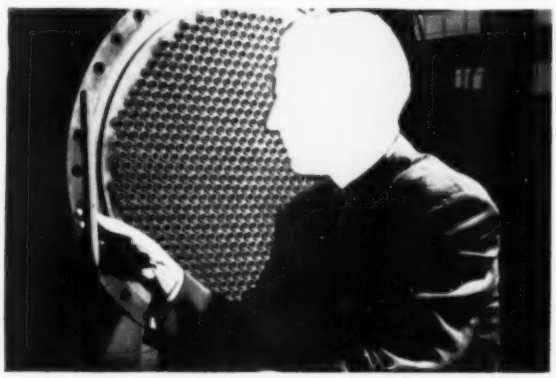
Here are four *actual* customers* with different, but exacting product and technical needs. One uses Bridgeport rod in a range of alloys, the second Bridgeport strip. A third makes fasteners from Bridgeport Brass wire. The fourth company uses Bridgeport condenser tubes *and* Technical Service to produce quality heat exchangers. Which picture do you fit with your raw materials and manufacturing requirements?

"AUTOMATIC QUALITY," says Customer A. "We've a high-volume, automatic screw machine operation. Our alloy needs vary from job to job. Our production schedules demand *consistent* quality alloy and accurate gauge. With every rod alloy we get from Bridgeport, we get what we order . . . including aluminum alloys!"

"LONG-LENGTH COILS. They're one reason why we can depend on Bridgeport for strip," says Customer B. "Superior surface finish from Bridgeport saves us production costs. With their Sendzimir mill finish and exact gauge and width in long-length coil, you can see the reasons why we depend on Bridgeport for brass, copper and aluminum strip."



"CONSISTENT GAUGE. We need Bridgeport quality brass wire to make thousands and thousands of fasteners of every description," says Customer C. "High-speed, volume cold-heading production is only as good as the alloy wire that's used. Bridgeport Brass wire is made to exact tolerances for cold-heading at high speeds—we depend on it."



"PRODUCT PLUS SERVICE," says Customer D. "We manufacture heat exchangers for many applications. Our requirements include good technical and engineering service as well as a wide choice of brass, copper and aluminum tube alloys. All of these are available from Bridgeport."

*Names on request

These examples typify national metalworking opinions. There's no mystery why manufacturers the country over depend on Bridgeport—Bridgeport products and service are *close at hand*. The many brass, copper and aluminum alloys made by Bridgeport in rod, tube, wire and strip are *readily* available from stocks in your area; Bridgeport warehouses are located to make it easy for you to get what you want on time. Volume needs are mill-delivered. Your call to your nearest Bridgeport Sales Office, or a letter to Dept. 3012 will get you engineering and technical service. Try it, and you'll agree —you do fit into the picture!

Bridgeport BRASS

BRIDGEPORT BRASS COMPANY

Bridgeport 2, Conn. • Sales Offices in Principal Cities

Specialists in Metals from Aluminum to Zirconium

LUFKIN . . .

precision tools for the perfectionist

New lifetime 701 has vernier that adjusts for jaw wear

You can lap jaws time after time without destroying accuracy. That's because vernier plate is adjustable. One vernier for both inside and outside readings. Use it, too, as a depth gage and to find root measurements.

Nonglare chrome finish on hardened stainless steel . . . both stress and strain relieved to prevent changes in size and shape.

Long vernier means easier reading because of wider spacing. And there are fewer bars to align. Readings on bottom scale are .001"; on top scale, 1 128". $27.80 in wood case.

Always buy from your Lufkin distributor. He knows precision tools. His stock is maintained to fit your needs. He is always ready to give you prompt and reliable service.

LUFKIN VERNIER CALIPERS

TAPES · RULES · PRECISION TOOLS

This is a knock-out cavity bushing.

It is used in plastic injection molding.

It is manufactured by *FASTEX,*

Division of Illinois Tool Works, Des Plaines, Illinois.

It has a

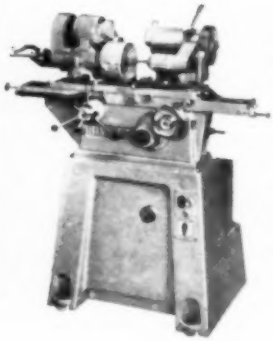
internal taper.

It is ground from hardened tool steel, 58-60 Rockwell C

The tolerances must be held to 0.0002"

The grinder on which this bushing and all its cousins are made is a

RIVETT MODEL 84

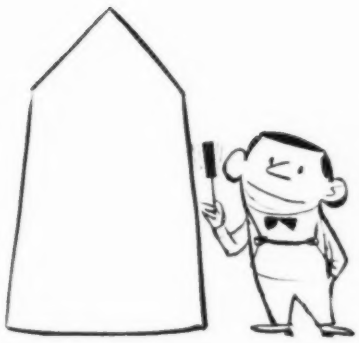


Model 84
An internal specialist with external ability. Mounts interchangeable wheelheads for internal and external spindles. Capacities are 3" diameters, depth 4". Collets and step chucks mount directly in lathe-type spindle.

RIVETT LATHE & GRINDER, Inc.

Dept. AM-11, Brighton 35, Boston, Mass.

Talking Shop...



Sound Test

ONE of the inspections performed on solid-fuel missiles is to tap the case with the handle of a screwdriver to see if the fuel has broken away from the case. This is referred to as "ultra-low-frequency sound testing."

Quote

"ENGINEERING change costs cannot be controlled by merely shooting the engineers."

Name Settled?

BIGGEST name confusion among the new processes is in the process that AMERICAN MACHINIST called roll flowing in the first article published on the process a number of years ago. The process has a number of trade names including Flo-Turn, Hydro-Spin, and Spin-Forge. A popular general term was roll forming, but this was hopelessly confusing. Now there is a growing acceptance by industry of the term "shear forming." This describes the method reasonably well and avoids confusion with older techniques. We think it will probably win out and we'll use it in the future.

Sparking Characteristics

SPARKING CHARACTERISTICS of metals can be determined by a technique devised by the Navy for selection of materials safe for use in explosive atmospheres. The technique involves a spark test using a gasoline and oxygen-enriched air mixture. A clear distinction is made between safe and unsafe metals. The Navy developed the method to establish sparking test requirements for non-sparking tools.

Among metals identified as safe to use in tools or other devices in explosive atmospheres are manganese bronze, phosphorus bronze, aluminum bronze, commercial brass, aluminum, and beryllium copper. Unsafe metals include carbon steel, carbon tool steel, high-speed tool steel, stainless steel, and monel. Metal-wheel and metal-rod combinations were found safe, while abrasive wheel and metal-rod combinations were unsafe.

A report on the method, PB 151650 *Sparking Characteristics of Metals*, G J Dashefsky, New York Naval Shipyard, U S Navy, Aug 1958, may be ordered from OTS, U S Department of Commerce, Washington 25. It contains 18 pages, costs 50 cents. (A related report, released earlier and still available from OTS, is PB 131131 *Sparking Characteristics and Safety Hazards of Metallic Materials*, H Bernstein, U S Naval Gun Factory, April 1957, 36 pages, $1.)

Tank Heat Treat

ONE way to hold size on a large tank is to pressurize it during heat treat. But, as W F Knabb of Solar Aircraft says, try it the first time in a furnace you don't care much about. However, at Solar this is one method that is now used with success—and safety.

Throw Rocks

PEOPLE who've worked together too long are likely to work less well, so you must "throw a rock" in such a contented pool to make it more productive. This unorthodox opinion comes from John Lawrence, executive vice president of Dresser Industries. Regroup these people to provide fresh ideas, he says.

Motivation can come in four ways, says Mr Lawrence: 1. short-term incentives (such as piecework); 2. long-term incentives (including hope of becoming president of the company some day); 3. an atmosphere of work; and 4. fear—that there is someone available who can do his job.

Use for Scrap

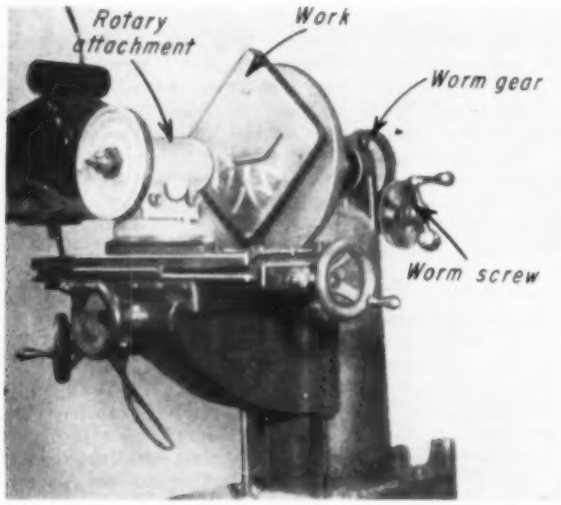
A PRACTICAL use for scrap parts is to send them through the heat-treating cycle—then make destructive tests. This practical approach, suggested by the practice at Wisconsin Axle (where it is used on gears) carries only one caution: Be sure you know which pieces are scrap.

Core Problem

WHEN a sphere must be made of glass-reinforced plastic, it is possible to wind the fibers around a core and then impregnate with plastic. This method is used by Aerojet-General to fabricate fuel tanks for several missiles. But how do you get that core out? You make it of a low-melting alloy or a water-soluble material and melt or work it out through the tank opening. To make these tanks leakproof, they are lined with a thin layer of silicone.

Practical Ideas...

Rotary-Milling Attachment Produces Economical Molds



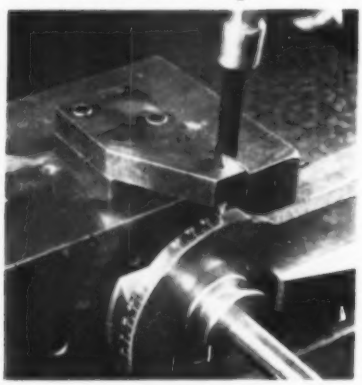
By reversing the process of the machine spindle holding the cutting tool and the work being attached to the table, molds, large radii, as well as many other die-sinking jobs—beyond the capacity of the machine—are made possible. In this case, the work is mounted on a faceplate fitted to the spindle, while the cutter is powered by a self-contained attachment on a swivel base bolted to the table.

The machine is a small bench miller used unaltered with the exception of a chiseled and filed flat on the back of the column to accept the mountings for a worm-screw shaft. The work-holding spindle operates directly in the split over-arm bores and is threaded on the front end to take our lathe faceplates and chucks. Spindle end play is removed by a stop ring located next to the column on the back end and inside a worm gear. I use a worm-to-gear ratio of 60 to 1 which not only gives me close control but also the necessary torque to drive the work against the cutter.

The cutting-tool spindle is carried in sealed-ball bearings housed in a T-casting. The casting base, being machined to mount on top of a graduated machine-vise base—on which the attachment can be used for angular settings—can also be clamped directly to the table or raised on blocks as required. I machined the horizontal-spindle bore in the lathe with a fly-cutter bar between centers, the finished base mounted on the cross slide in place of the compound. As a result, I am able to use the attachment on the lathe for milling or grinding.

A F Wylie, Manhattan, Kansas

Neatness Improved With Stamping Jig



We sometimes build prototype and experimental machinery on which a number of graduated dials and scales are required. Because of the quantities involved, an investment in extensive tooling for marking this work is not warranted but, at the same time, the markings must be neat and legible. We have, therefore, made up improvised tools, similar to the one illustrated, that enable us to do a professional job at low cost.

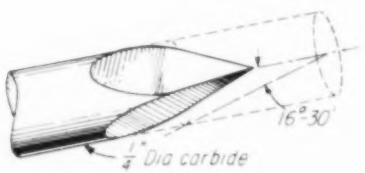
Standard individual stamps are guided in a hardened and ground plate secured to the top surface of a cast iron box parallel. The stamps are ground square to identical dimensions as the numbers and letters are centered. Perfect nesting is assured by a retainer spring on the side of the guide. A mandrel, fitted to the side of the parallel, supports the work so it can be rotated to each position under the stamp.

The job shown (a small compound-slide dial) is locked in position against the side of the parallel with a toolmaker's clamp. Impressions are made by striking the stamp a sharp blow with a light hammer. Spacings are made by eye as the work is rotated to each position and, with reasonable care, a very satisfactory job can be done.

H J Gerber, Stillwater, Okla

A Center-Hole Cleaning Tool

Before a part which has been heat treated can be mounted between centers for grinding, the residue left by the heat treatment must be removed from its center holes. If this substance is oxidation scale or salt, it won't be easy to do a good job with ordinary tool-steel scrapers.



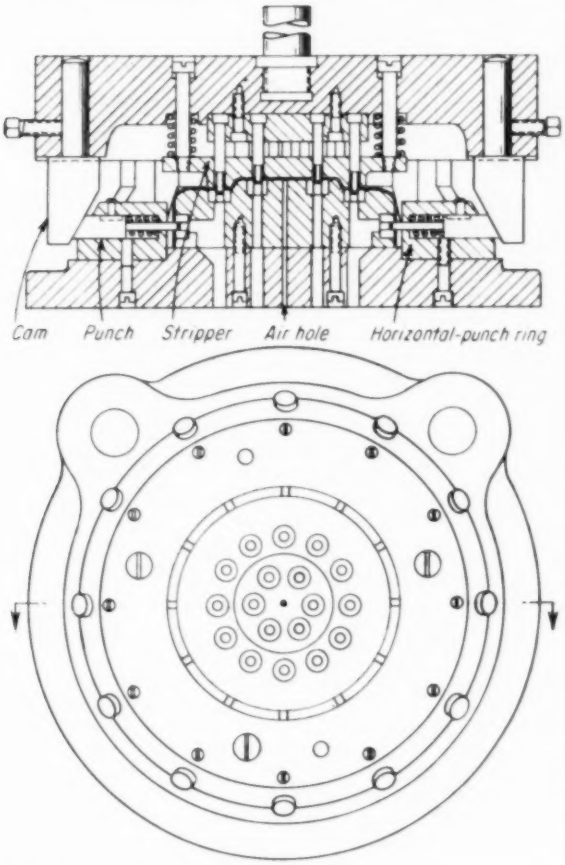
However, the tool shown reduces this annoying, but necessary, step in preparation to a small insignificant task. A few spins with this tool in a center hole cleans it of the tough, glass-hard scale and salt.

The fact that the tool can withstand these elements, and yet retain its edge, is that it's made of carbide. And a length of carbide, long enough to spin between the fingers is all you need. I use a 2-in. long piece of ¼-in. dia stock. Of course, should you insist on a more substantial grip, the carbide can easily be pressed into a file handle.

For a perfect 60° included angle three-corner point, grind three equally-spaced flats at 16° 30' to the axis of the rod. But what seems to work better for me is a point ground at 16°. It enables me to get into the bottom of the center hole for a thorough job faster.

L. D. Fladby, Toronto Ont, Canada

Die Pierces Holes in Drawn Parts at Any Angle to 90°



A previously drawn sheet-metal shell required 18 holes pierced in two circles around its bottom center, and 12 holes through its rim at 90° to the first. To economically accomplish this, a die that would perform both operations with one stroke was necessary.

Our approach to the problem and the resultant design are shown in the illustration. It's a combination die which, in addition to standard piercing punches in the punch side, employs cams to activate 12 horizontal punches located in the die half. Each horizontal punch is provided with an individual cam so that any one of the 12 can be deactivated according to specifications. Should there never be a call for excluding a station, all the cams can be incorporated into one solid ring.

The horizontal punches are housed in a ring concentrically located around the die block. Each punch is spring returned and is restricted and prevented from rotating by a small setscrew from the top of the ring engaging a slot in the punch. The cam-contacting ends of the punches are beveled and radiused to conform to the inner surfaces of the cams.

All hole locations in the die block are fitted with die buttons which makes for a longer lasting die since these can be replaced after a few sharpenings. Plentiful clearance for slugs is provided, particularly from the horizontal positions which, as shown in the drawing, blend with the vertical outer-circle holes.

The die is shown in closed position, the shell indicated by a heavy line. It is manually loaded and as the press ram comes down a heavily spring-loaded stripper plate contacts the shell first. This holds the shell firmly in place while the punches, particularly the horizontal ones, enter their proper locations. On the up stroke, the stripper plate keeps the shell secure as the punches retract, and at the very top of the stroke, an air blast is automatically triggered to pop the shell off the die.

Hjalmar Dahl, Upplands Vasby, Sweden

Unusual V-Block Simplifies Layout Work

The design of this V-block offers an advantage not found in conventional V-blocks—that of having known dimensions from the bottom face of the workpiece from either of two positions. This factor speeds the work of the layout man because it does away with the process of taking meaurements and making calculations to find the center, the point from which he must proceed.

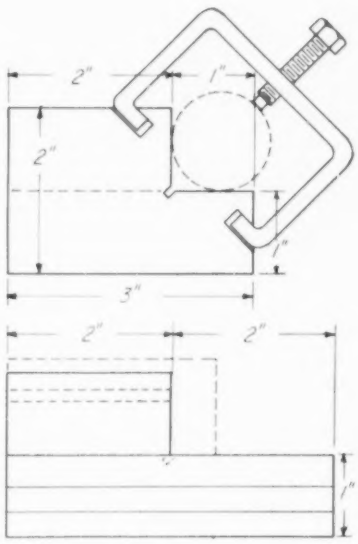
Another feature to consider is the simplicity of construction. A block of this kind can be made more accurately in less time than it would take to make an ordinary V-block. There are no off-square angles to hold and when finishing by grinding, it's as easy as making a parallel.

A piece of tool steel was used for the block shown at right. It was squared up to 4 in. long x 3 in. wide x 2 in. thick, plus allowances for grinding on all dimensions. A 1-in. step was next milled along one side and 2 in. of metal was removed from one end. This formed what appeared to be a 2 in. square x 1 in. high block on a 1 in. thick base. Two slots, one on top of the block and the other on the side of the base, were milled in line to accept a straddle clamp.

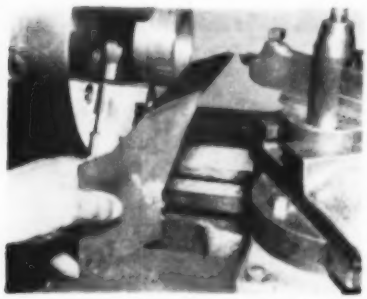
This preliminary machining completed, the block was hardened and ground all over, keeping all sides square and the dimensions from nest face to side 2.000 in. and base thickness 1.000 in. A relief in the bottom of the V was then ground.

Having a 2-in. capacity, the block can be used flat on its base as shown for a 1-in. elevation, or on its side to raise the piece 2 in.

R B Courtney, Whittier, Calif



Practical Ideas...



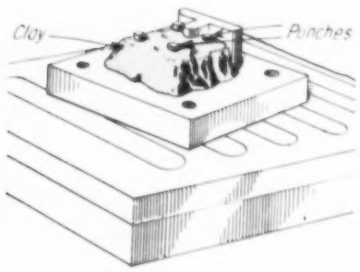
Gage Centers Turning Tool

There need never be any doubt as to the location of a turning tool when it has been set with the aid of a gage like the one shown. It also speeds tool positioning after tool has either been sharpened, shifted, or otherwise altered.

Made from 16 gage sheet metal, in a matter of minutes, it is designed to rest on the flat surface of the carriage reaching a little beyond the center of the spindle. After the top edge of the gage has been painted with a layout dye, either of two methods can be used in marking the center height. One is to scribe it with a vernier height gage which is also used to find the proper height. The other is to use the tool bit after it has been properly centered in facing off a piece of stock.

For a more permanent marking, the scribe line is deeply engraved with a hand scriber. A point is then formed to intersect the scribe line by cutting off the front corner of the gage at 30-35° to the line.

Earl L. Barker, Los Angeles, Calif

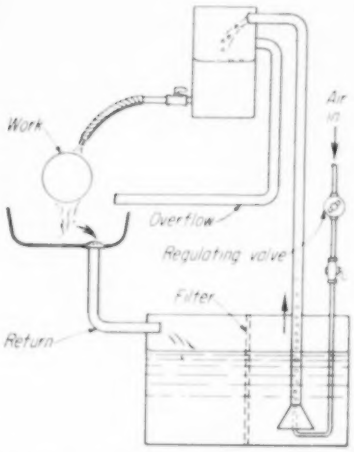


Putty Stiffens Punches

Here is a simple trick we use when we're sharpening slender punches on the surface grinder. We pack stiff putty, or modeling clay, solidly around these punches as near to the ends to be sharpened as possible. This stiffens them and serves as a damper against vibration which is the cause for thin punches breaking during grinding.

The cost of the putty and time spent in applying it are negligible, but will save hours of time in replacing a snapped punch.

Charles Willey, Penacook, New Hamp



Air Circulates Coolant

We have developed an arrangement to supply coolant to the work in our tool room. It does away with electric-powered pumps which sometimes are a source of frequent maintenance; instead we use air power from the shop air lines. Only a few pounds of pressure is needed, and very little air is consumed.

The air passes through a pressure regulator which maintains 2 to 3 lbs pressure at the discharge end. This air enters the coolant tank by way of a ¼-in. copper tubing and is discharged from the vertical end of the tube near the bottom. From there the air enters an inverted funnel soldered to another tube. This tube runs up in back of the lathe to a reservoir fitted with an overflow and a control valve for coolant flow. A line connected to the lathe or grinder pan returns the coolant to the tank.

When air is turned on, bubbles rise up the tube, lifting the coolant in the same manner water is lifted in a coffee perculator when heat generates air bubbles. When not in use, a valve on the air-supply line is shut off.

Ernest Jones, Bronx, NY

Paul M Laborn Jr,
Waco, Texas

WON

$25 In addition to regular payment for his idea:

A NEW APPLICATION FOR AN INSIDE MICROMETER

in the Aug. 24, 1959 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

Tuition Supplements—

One Good Way To Help Our Colleges And Universities

The business community has made an impressive start in going to the desperately needed financial aid of our colleges and universities. Business contributions to higher education have increased from only $40 million in 1950 to $136 million in 1958.

This rise in financial aid to higher education should be a great source of satisfaction to the business community. But it goes only part way toward meeting the growing needs of colleges and universities for financial help. Over the next ten years business aid to our privately supported colleges and universities alone must increase to at least $500 million a year merely to provide decent faculty salaries and meet the increased operating costs of taking care of enrollments that will almost double.

One pervasive reason why many business firms have not joined the ranks of the companies contributing to higher education seems to be that, in the interest of prestige and public relations, they are making their provision of aid contingent upon finding some particularly novel way of providing it. So long as this point of view persists, business aid will lag, for there are simply not enough ways of providing financial aid that are both notably novel and sensible.*

How The Plan Works

There are, however, some well-tested ways of providing aid which improve rather than fade in appeal with more using. One such way is the making of supplemental tuition payments to colleges and universities at which a company's employees take courses.

Many companies have scholarship or tuition-refund programs which cover all or part of the costs to their *employees* of taking college courses. But, in most colleges and universities, tuition charges fall far short of covering the full cost of the education given. By making an unrestricted "cost-of-education" grant a part of their employee scholarship or tuition-refund plans, these companies could make a material contribution toward covering the *college's* full costs as well.

The tuition supplement can be a fixed amount or a percentage of the tuition charged. Some plans provide for supplements as high as 100% of tuition, though there is usually an upper limit to the total supplemental payment given for each employee enrolled in the institution.

The plan seems to have originated with the Ford Motor Company Fund. When we at McGraw-Hill first learned of it, it appealed to us as having so many advantages, and so few disadvantages, that we adopted it as one part of our own program of financial aid.

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*The efforts of the McGraw-Hill Publishing Company to find a suitable method of aiding higher education prompted the writing of a "more or less Socratic dialog" entitled *A Business Wrestling with the Problem of Aid to Colleges and Universities*. Copies of this pamphlet, which underlines the difficulty of finding both a novel and satisfactory method of providing aid, are available on request.

HOW THE HEADS OF SOME OF THE INSTITUTIONS TO WHICH McGRAW-HILL HAS MADE GRANTS FEEL ABOUT THE TUITION SUPPLEMENT PLAN

"We are pleased not only because this addition to the never adequate supply of non-earmarked funds is a most welcome one, but also because it attests to the fact that the employees of our neighboring business firms are benefiting from the courses we offer at times convenient for them. We hope this mutually beneficial plan may continue and grow with the years."

Grayson Kirk, President
Columbia University

"I shall take this occasion to express deep sentiments of appreciation, in my own name and in the name of the members of the Board of Trustees, for the very effective manner in which your corporation is aiding higher education by the payments made under your tuition supplement plan. Certainly your action is indicative of the fact that you realize industry and higher education must join forces to preserve the basic American system of free enterprise."

Very Reverend John A. Flynn, C.M.
President, St. John's University

"The growing recognition by business and industry of the financial needs and important services rendered to the community by the colleges and universities is most encouraging, and Temple University is deeply appreciative of the fine support extended through McGraw-Hill's program of supplementary grants."

Robert L. Johnson, President
Temple University

The Plan's Advantages

The main advantages of the tuition supplement plan are:

- **It is simple and easily administered.** Payments can be made when scholarships or tuition refunds are granted, or at another time convenient to the company.
- **It relieves the company of the difficult and sometimes disagreeable task of choosing one college rather than another.** The individual employee makes the choice.
- **It directly serves the interest of the company by encouraging and aiding the institutions where its employees take courses.** In a sense, the company makes contributions in direct proportion to the value it receives in education for its employees.
- **It directly serves the interest of the colleges and universities receiving the grants by getting money to them in the form most appreciated**—unrestricted funds to be used at the discretion of their administrators.

Largely because tuition supplements are unrestricted as to use, this plan enjoys the unqualified approval and gratitude of the schools receiving such aid. This is not true of some of the other plans for granting aid to colleges and universities.

Tuition supplements, of course, can't be regarded as large efforts relative to the need of higher education and the responsibilities of business. But they are a very practical and useful first step, involving almost no problems. If you are not familiar with the idea of supplemental grants, why not discuss it with some of your friends in the field of higher education?

The Price Of Novelty

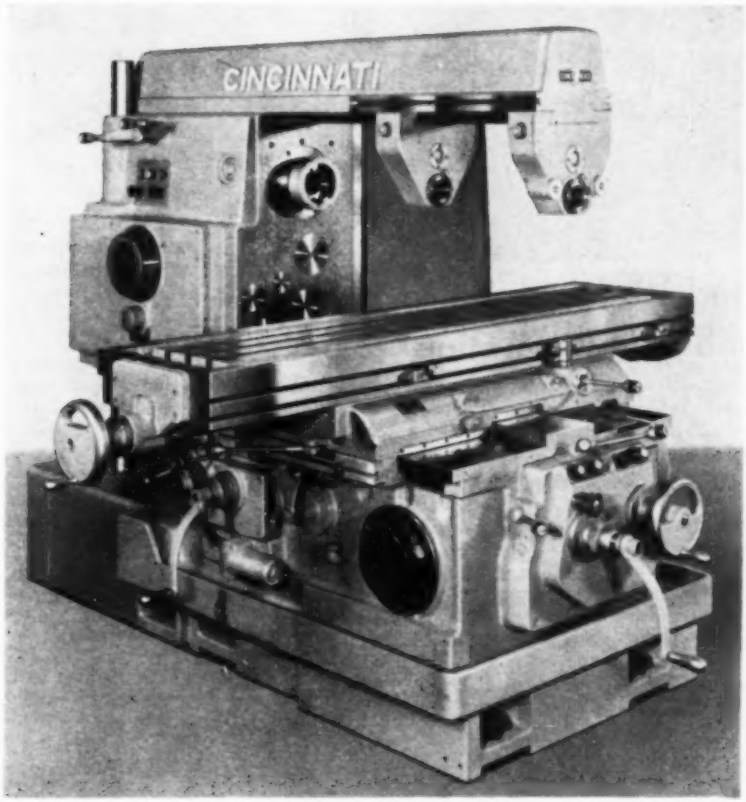
Our experience with tuition supplements indicates that this is an excellent plan, and we are glad to recommend it to other companies looking for an effective method of providing financial aid to higher education.

At any rate, we hope that business firms will not postpone granting financial aid until they find some novel way of doing it. If they do, it will be another case of too little and too late.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT
McGRAW-HILL PUBLISHING COMPANY, INC.

New Shop Equipment
Materials and Parts



Cincinnati's Fixed-Knee Milling Machine Said To Offer Advantages of Three Units

New fixed-knee milling machine introduced by Cincinnati Milling Machine Co is said to offer the rigidity of a bed-type, the convenience of a knee-and-column-type, and the capacity of a rise-and-fall-type machine.

The general purpose mill transfers vertical motion to the spindle carrier and has the saddle and table mounted directly on the machine bed. The square gibbed ways are extra wide to handle heavy cuts, climb and conventional milling, and large workpieces. Rise-and-fall motion is transmitted vertically through a screw which also serves as a secondary point of suspension for the spindle carrier.

Machine has 32 feeds and 24 speeds, both in geometric progression. It is available in four models ranging from 20 to 30 hp, 72 to 80 in. table travel, 12 in. saddle travel and 20 in. vertical travel. Options and accessories are the same as offered for the Dual Power line.

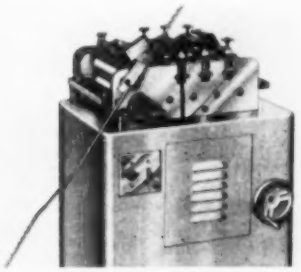
Arbor rotates in supports mounted on the vibration-dampening Dynapoise overarm. Arbor-Loc spindle nose on the face of the spindle carrier provides for fast tool changes.

Two sets of controls—one in front and one on the side of the base behind the saddle—permit the operator to use either set if his view of the cutting action is blocked by the workpiece. Controls include push button power speed selection, power feed selection through knobs, and hand controls for longitudinal, cross, and vertical movements.

Mill can handle reciprocating, box milling, and climb cuts. An automatic backlash eliminator, consisting of two counter-rotating gear-driven nuts on the table feed screw, prevents chatter and assures smooth cuts. The operator can cycle the machine manually or automatically. Automatic cycling is actuated by trip dogs in the T-slots on the front of the table.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio

MORE DATA? Circle 51, inside back cover



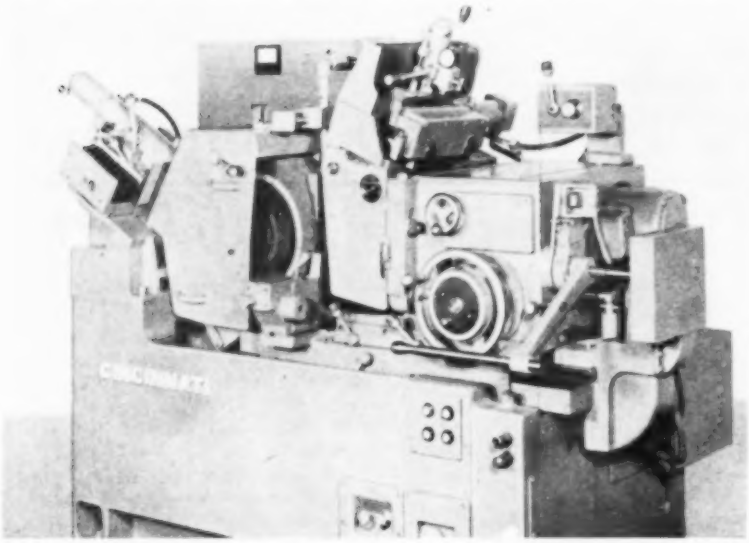
Line of Stock Straighteners Offered in Six Models

New straightener handles coiled stock 4 to 10 in. in width and 0.020 to ⅛ in. in thickness. Models are available with 5 or 7 rolls and with motor ratings ½ to 1 hp. Unit, capable of 20 to 80-fpm stockfeed, holds stock at 40-in. height. Completely self-contained within a roll-about cabinet, it occupies floor space of 17 x 22 in.

Each model has variable speed control which permits setting operating speed at the most suitable point for automatic feed of press. Each is also equipped with two motor-driven pinch rolls, powering all lower rolls. Upper straightening rolls are individually adjustable for proper setting. In addition to removing coil set, the machine may be used for straightening blanked parts and for deburring shear slit stock.

H E Dickerman Mfg Co, 321 Albany St, Springfield, Mass

MORE DATA? Circle 52, inside back cover



Cincinnati Centerless Grinder Designed For Quick-Changeover Job Shop Operation

Model 210-6 Centuramic centerless grinder is designed specifically for short run work, quick changeover, and operator convenience. The 10-hp machine handles work up to 3 in. OD and can be equipped with either a 6- or 8-in. wheel.

It is said to be especially useful for job shop operations where short runs dictate handfeeding and frequent setups. Out-of-the-way location of the coolant tank and hydraulic unit and a large toe-room recess under the machine, allow the operator to stand close to the work for dead passing or workblade adjustment. The regulating wheel truing attachment is inclined 20° to open the throat for easy access. Infeed adjustment wheels are available at both front and rear. There are said to be no obstructions at any setup or operation position.

A new mist control system creates a mechanical draft that prevents coolant oil from spattering the operator. A mist collecting nozzle automatically adjusts to wheel diameter.

The Centuramic line also includes 200 and 300 Series machines for wide wheel production grinding. All grinders in the line are equipped with Filmatic spindle bearings which self-adjust for rough or finished cuts. The regulating wheel unit has a center-mounted chain drive which places the driving force squarely between the spindle bearings and applies the force in the same direction as the work force. This is said to minimize pinch-out in interrupted thru-feed work. Regulating wheel speed, infinitely variable between 11-300 rpm, is adjusted by a hand wheel and read from a tachometer.

Cincinnati Milling Machine Co, Cincinnati 9, Ohio

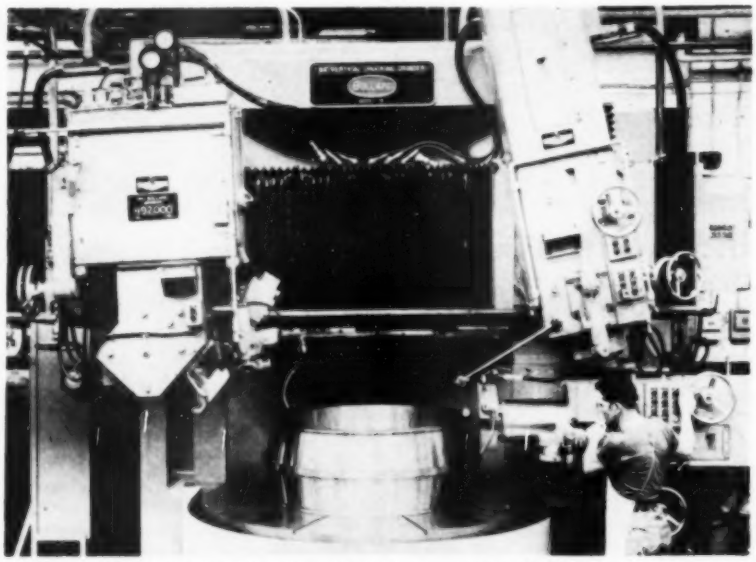
MORE DATA? Circle 53, inside back cover

Two-Axis Numerical Control Developed for Profile Milling

Two-axis numerical control system designed for machining complex parts on rotary profile milling machines is said to provide cost savings over conventional machining methods.

System can be used to machine parts with two-dimensional contours of the type usually defined by polar coordinates, such as cams, spur gears, transmission housings, or compressor blade housings for jet engines.

The numerical control unit pro-



VERTICAL CHUCKING GRINDER, with 84 in. magnetic chucking table, can grind bearings with over 7 ft OD. Runout is held to 0.0002 in. Side spindle and right vertical spindle have speed of 1200 rpm. Left vertical spindle can run in either direction at 600 to 3000 rpm. Chuck revolves at 13.4 to 81 rpm and vertical heads have 9.4 to 45.9 ipm feed. Grinder, which cost $192,000, is installed at Timken Roller Bearing's Canton, Ohio, plant—*Bullard Co, 286 Canfield Ave, Bridgeport 2, Conn.*

MORE DATA? Circle 54, inside back cover

vides command pulses of 0.0002 in. to the linear axis and 0.002° command pulses to the rotary axis. Tape reader reads instructions in blocks at 300 lines per second forward and 600 lines per second reverse. The digital system is of the dc level type, using vacuum tube flip-flops and germanium diode gate circuits. Magnetic core shift registers are used for the limited number storage requirements. The printed circuits are mounted in plug-in packages.

Bendix Industrial Controls Section, Bendix Aviation Corp, 21820 Wyoming Ave, Detroit 37, Mich

MORE DATA? Circle 55, inside back cover

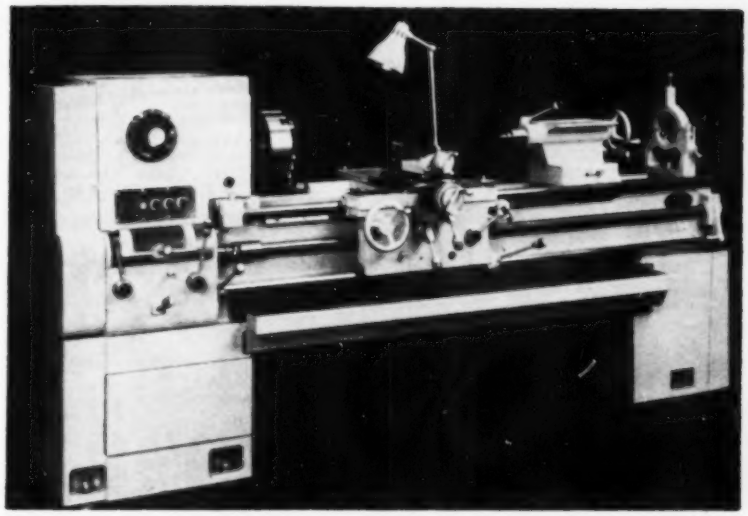
Bevel Gear Blank Checker Introduced by Gleason

No. 15 machine uses simple dials and wheels to replace earlier hand operations. Gear blank is mounted on an arbor on the work spindle table which has a horizontal adjustment and double dial for setting the OD. Measuring head has a vertical adjustment with a double dial for setting the crown-to-back dimension.

Adjustable slide carries an indicator and can be set to the face angle or back angle. With the vertical adjustment, horizontal adjustment, and face angle all properly set, the indicator reads zero as it trams the face cone of a perfect blank. Noting the manner in which the indicator varies from zero with an imperfect blank, the operator can easily identify the error as one of face angle, back angle, OD, or crown-to-back dimension. A handwheel is provided so that the blank can also be checked for axial or radial runout while it is rotated on the machine spindle. Blanks from 2 to 15 in. in diameter can be checked.

Gleason Works, 1000 University Ave, Rochester, NY

MORE DATA? Circle 56, inside back cover



Line of Lowcost Lathes Features Hydraulic Selection of Spindle Speeds to 3000 rpm

Hydrashift line of lathes is said to be the first lowcost line of geared head lathes to be equipped with hydraulic spindle speed selection. Dial on the headstock is set to any of 12 speeds and gears are shifted automatically.

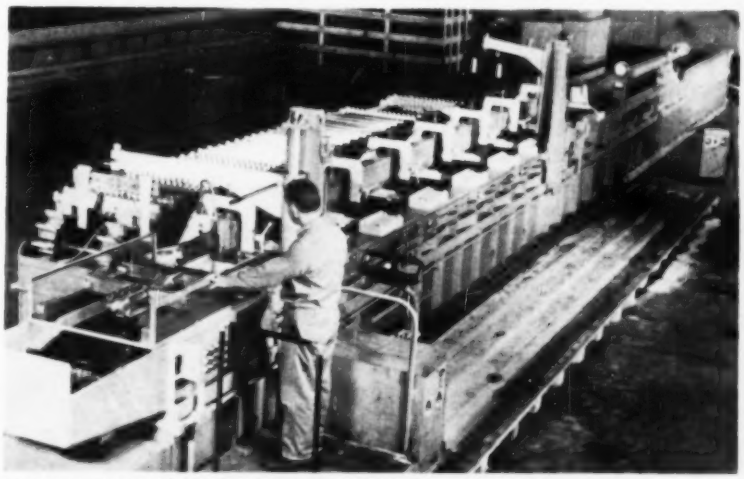
Lathes have wider, heavier compounds and cross-slides and top speed of 3000 rpm to handle carbide and ceramic tooling. Quick-change feed selection provides 48 threads and feeds.

Line includes 10, 12½, 15 and 18 in. swing sizes in a wide variety of bed lengths, and raised models for the 18 in. machine. The 15 and 18 in. sizes can be equipped with Hydraguide tracers. Price of the 15 x 54 in. model is $4575.

New quick-clamp headstock is held in position by a single lever for rapid tailstock positioning. Aids for the operator include coded push-button controls, chip pan which slides in and out for easy cleaning, trays on headstock and tailstock to hold tools and gages.

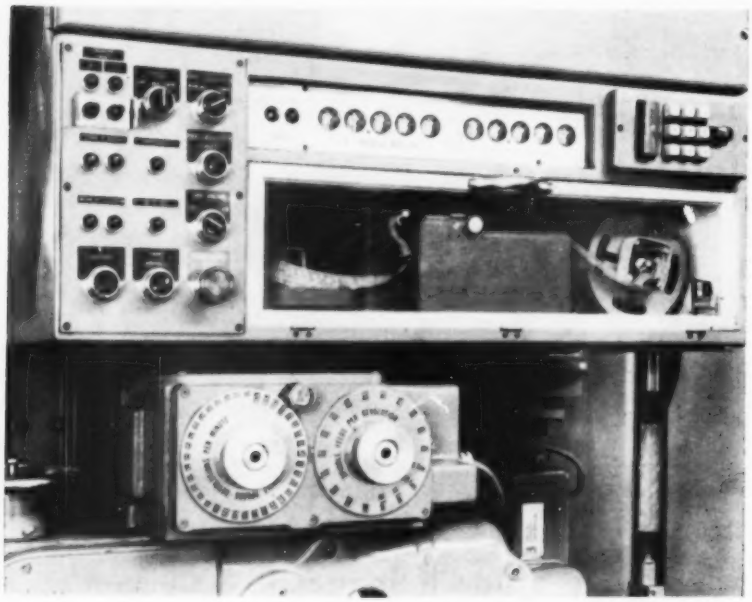
Cincinnati Lathe and Tool Co, Cincinnati 9, Ohio

MORE DATA? Circle 57, inside back cover



LONGEST HOLE EVER BROACHED is claimed for the inside contour of this 24-ft long helicopter spar. Broaches are handled by a conveyor system which places each broach in the correct position at the entering end and picks it up after the stroke. Machine measures 66 ft long and uses a 50-hp drive. It obtains a finish better than 50 microinches—*Lapointe Machine Tool Co, Hudson, Mass*

MORE DATA? Circle 58, inside back cover



Carlton Introduces Numerical Control Unit for Boring and Drilling Machines

A new numerical control unit has been developed by Carlton Machine Tool Co., in conjunction with Carlton Controls Corp, for use on its horizontal and planer type boring and drilling machines.

Programming can be done by three methods:

- Tape control can be used for automatic three-axis positioning of the tool, plus automatic speed and feed changes. Zero offset establishes new starting point from the workpiece regardless of location. Tape is standard 1 in. wide, 8 channel type.
- Keyboard for separate, non-taped operations provides manual input of 5 or 6-digit numerical data for each axis. Numerical values, actuated by keyboard or tape, are shown by indicator lights.
- Pushbuttons control rapid traverse and slow traverse power units and position the axis movements for manually operating the machine to establish different data points when needed.

Carlton Machine Tool Co, Cincinnati 25, Ohio

MORE DATA? Circle 59, inside back cover

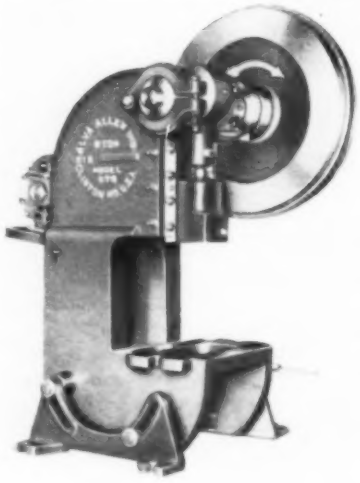
8-Ton Punch Press Has 7-Inch Shut Height, 5-Inch Throat

Model BT-8, 8-ton punch press has die space of 7 in. shut height and 5 in. throat to accommodate parts which previously required presses of larger design. Available in both bench and floor models, the 8-ton press fills out the company's punch press line of 5 and 12-ton models.

Crankshaft diameter at main bearings is 1½ in. and die bed is 7 x 12 in. with bed opening of 4 x 6 in. Flywheel weighs 115 lbs, is 16 in. dia with a 3 in. face. Standard stroke is 1½ in. with special strokes of ¼ to 3 in. available at extra cost. Bench press complete with brake, motor mount, V-belt and pulley sells for $347.50, FOB.

Alva Allen Industries, 1001-15 N 3rd St, Clinton, Mo

MORE DATA? Circle 60, inside back cover



Austrian Copy Shaper Forms EDM Electrodes

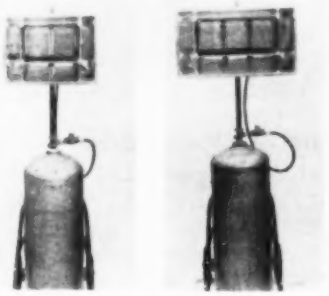
Anderle (Austrian) copy shaper Type URK is designed to make electrodes for electrical discharge machining as well as conventional punches, dies, and form tools. Working from a templet or master, the hydraulic shaper is said to cut machining time as much as 87%.

The machine consists of a regular shaper ram and a sensitive hydraulically controlled universal table, which is equipped with an infinitely variable power feed for cross and circular motion. Every vertical deviation of the templet is transferred to the table within 0.0005 in.

Specifications include: 0-12 in. ram stroke, 30-180 spm, 3½ in. vertical tool travel, 10 in. table cross feed, 5½ in. vertical table travel, 12 x 14 in. table, 0-11 in. between centers, 4 in. high centers. Price is $6,190 POE Chicago.

Imported by Mercuria Co, 156 Burlington Ave, Clarendon Hills, Ill

MORE DATA? Circle 61, inside back cover



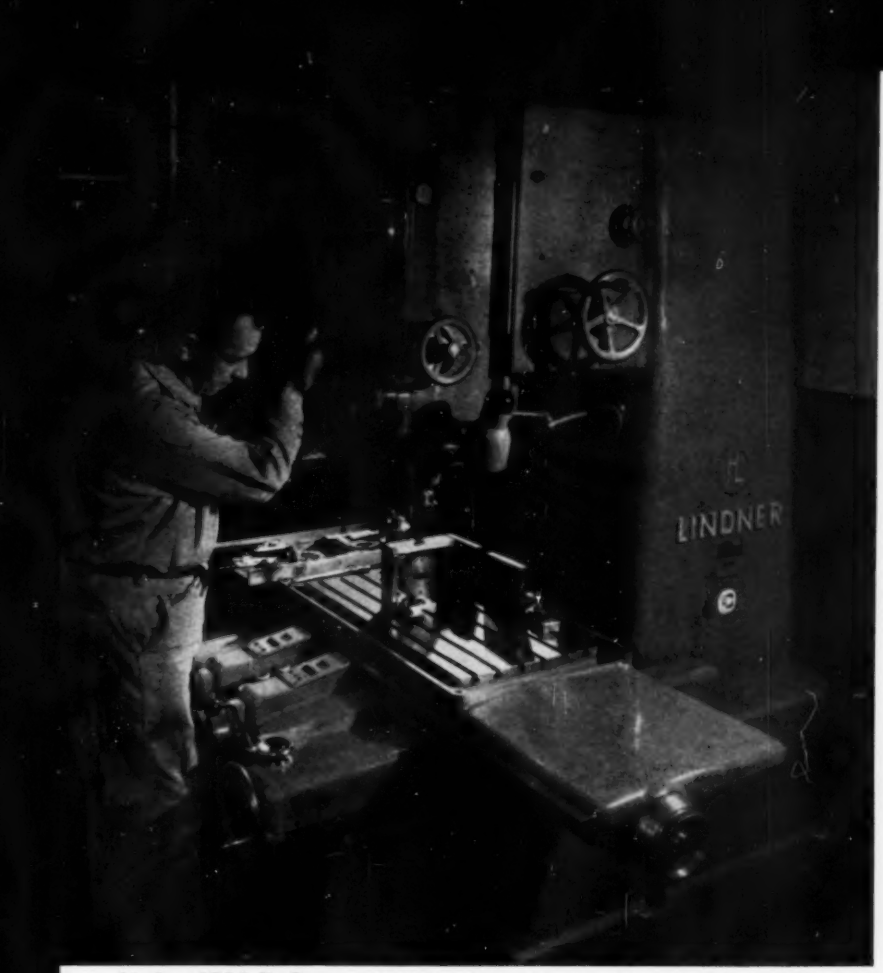
Infra-Red Units Provide Lowcost Spot Heating

Portable gas-fired infra-red heaters provide radiant heat that can be concentrated on specific areas by polished parabolic reflectors without heating the surrounding air. Used for spot heating in plants, the units are said to keep workmen, tools, and material comfortably warm even when temperatures are below zero.

Infra-red rays are produced by burning propane gas on the surface of a ⅜ in. thick perforated ceramic mat containing 200 holes per sq in. The larger model (right) is rated at 36,000 Btu input and operates for less than 15 cents an hour. The smaller unit (left) costs less than 10 an hour to run and is rated at 24,000 Btu.

Perfection Industries, Div of Hupp Corp, 1135 Ivanhoe Rd, Cleveland 10, Ohio

MORE DATA? Circle 62, inside back cover



Lindner LB14 Jig Borer at Philips Electronics, Inc., Mount Vernon, N. Y., has 32" x 16" table. Also available in larger model, LB15A with Autopositioner®—Table 44" x 24".

Precision Production—Boring 20 holes in the specimen plate cover of the Norelco Model 100KV Spectrograph. Done in one set-up. Time: 2 hours. 30% *faster than previous methods!*

Precision Tooling—Boring holes in a drill jig for the Norelco Powder Camera. Opposite holes must be aligned within .0001".

How the Lindner Optical Measuring System brings greater precision to jig boring

at Philips Electronics, Inc.

A jig borer can be no more accurate than its measuring system. And in the Lindner the problem of maintaining *permanent* accuracy has been solved by the machine's unique *fully optical* measuring system.

No lead screws. No gage blocks. No bars or limit switches. The helically scribed, cylindrical measuring scales in every Lindner are touched by a light beam only. These scales are independent of the table movement mechanism and *immovable* in axial direction. Thus, the whole system is permanently protected against any mechanical wear whatsoever. Lifetime accuracy!

Visual fatigue and errors in settings are minimized by a photo-electric centering device. It makes possible initial and repeat settings guaranteed accurate within .00015" over the full length of travel and readings in .00005".

There's no eye strain or bending. A helical line from the measuring scale is projected onto a 2½" wide screen which the operator reads from a standing position. No eyepiece required.

That's why Philips Electronics—like so many other precision producers—relies on the Lindner for tooling, production and inspection of its Norelco atom measuring equipment and other precision research tools.

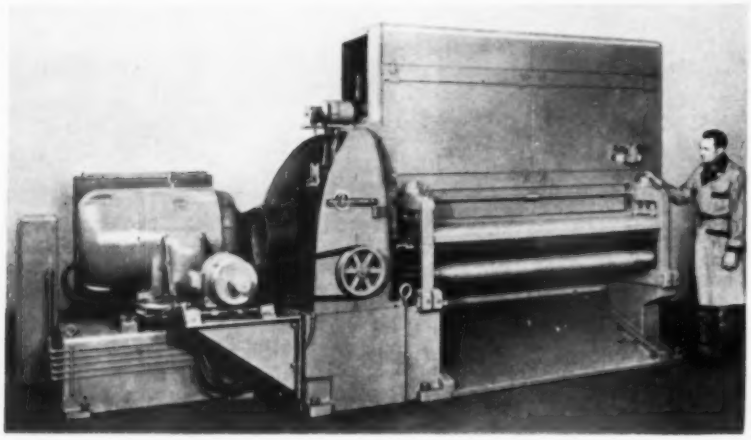
The Lindner optical measuring system is changing ideas about jig boring all over the country. We've packed all the facts into a meaty 25-minute movie film. Send for it today without obligation. Or write for literature.

KO CO., INC. PRECISION MACHINERY

KURT ORBAN COMPANY, INC.

36 Exchange Place, Jersey City 2, New Jersey

CIRCLE 240 READER SERVIC CARD



Automatic Polishing Mills Finish Sheet, Plate and Coil Stock at Feeds to 60 fpm

Continuous automatic polishing mills perform abrasive belt-finishing operations on metal sheets and plates from 3-ft long as well as on coils at feeds from 20 to 60 fpm.

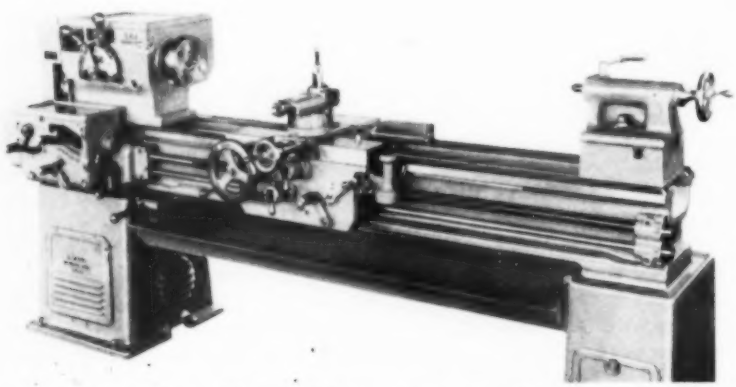
These mills have four main operating components: an idler roll, contact roll, billy roll, and pinch rolls. The abrasive belt is supported by idler rolls and the contact roll, which is driven by the main drive motor through a v-belt. An air cylinder raises and lowers the idler roll assembly to maintain belt tension. The belt is oscillated and tracked by pivoting the idler roll with an air cylinder controlled by a photoelectric cell.

Sheet is passed through the mill between the contact and billy roll by individual assemblies of four pinch rolls, one set ahead of and one set behind the contact roll. The pinch rolls are driven in either direction by a separate motor through worm gear transmissions and flexible couplings. When stock removal on sizing operations is within 0.010 in., a thickness tolerance of ±0.001 in. can be consistently produced on the finished sheet.

The mills are made to a standardized design with features altered to suit the specifications of the particular operation. Units can be supplied to handle widths of 30, 40, 54, or 74 in. The 74-in. model (illustrated) has a 150-hp main drive motor and a 75-in. wide belt. It occupies floor space of approximately 5½ x 16½ ft and is about 9 ft high.

Acme Mfg Co, 1500 E Nine Mile Rd, Detroit 20, Mich

MORE DATA? Circle 63, inside back cover



18-IN LATHE, similar to 16-in. model recently announced by the company, has 5 hp motor, all-geared headstock with 12 spindle speeds ranging from 20 to 900 rpm. Quick-change gearbox has 48 separate threads and feeds. It can be supplied with short, medium, or long beds—*Carroll-Jamieson Machine Tool Co, Batavia, Ohio*

MORE DATA? Circle 64, inside back cover

150-Ton Electric Hydraulic Press Introduced by ACCO

New 150-ton electric hydraulic press is available in two models: MPH-150-E22 which has a 2-hp motor and a ram speed at no load of 4.2 ipm and 2 ipm at full load and MPH-150-E55 which has a 5-hp motor and a ram speed at no load of 11 ipm and 7.5 ipm at full load.

The ram, made from solid bar stock 8620 steel, has a Rockwell 060 case and a 16 microinch finish. A hand wheel, geared to a square-thread Acme ram-extension screw, permits rapid approach to the work, makes the contact necessary for proper positioning, and reserves the full power stroke for the work to be performed.

Specifications include: 8 in. ram travel, 8 in. screw travel, 24 in. table travel, 19⅜ horizontal head travel, 29½ in. ram-to-table maximum, 48 in. width between uprights, 12¼ in width between table channels.

American Chain and Cable Co, Inc, 929 Connecticut Ave, Bridgeport, Conn

MORE DATA? Circle 65, inside back cover

All-Purpose Tenth Plug Gage Sets Offered in Sizes 0.120 to 1 in.

Features of gages include precision lapping to approximately 1 mu-in. finish, and cold stablization during heat treating. Sizes 3/64 to 3/32 in. are superfinished.

Extremely close tolerance, coupled with steps of 0.0001, 12 up and 12 down from nominal in each set, provides precision inspection gages at a cost comparable to work gages. Precision and production inspection, starting with initial work stages and continuing through final inspection, can be accomplished with greater speed and accuracy, because the low initial cost enables use of the gages as an expendable item where and as required. Replacement gages are provided when needed for $2.50 each.

Deltronic, 929 Baker St, Costa Mesa, Calif

MORE DATA? Circle 66, inside back cover

courtesy Ready Machine Tool & Die Co., Inc.

Gilbert boring mill makes money for Ready Machine Tool & Die

"This 5" Cincinnati Gilbert boring mill is already making money for us, and that's why we bought it," says C. P. Ready, President of Ready Machine Tool & Die Co., Inc., Connersville, Ind.

"For instance, with its precision positioning system, we can lay out holes directly from a print. This saves all the time we used to take to make and use templates."

And there are other things that make this Cincinnati Gilbert a profitable machine for tool and die shops. Plenty of direct power at the tool for heavy cuts. Accuracy for the tightest specs. Capacity for big work pieces.

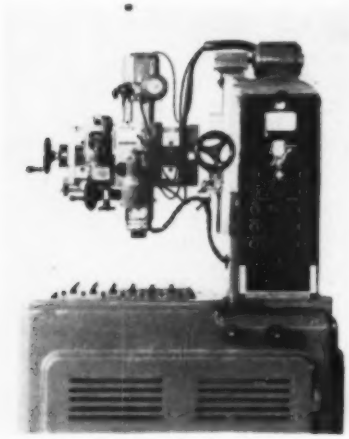
Installed in the Ready plant are two of these modern machines; one table type, one floor type—proof of their confidence in Gilberts.

The Cincinnati Gilbert Machine Tool Co., 3340 Beekman St., Cincinnati 23, Ohio.

Write for new catalog

GILBERT

CIRCLE 241 READER SERVICE CARD



Electric Discharge Machine Gets 10 Microinch Finish

Model E-500 Electric Erosion Machine (Italian), for machining tungsten carbides, hardened steels, and similar metals, has the following improvements over the E-400 model introduced three years ago:

The electric system has been improved to provide finishes up to 10 microinches — the best commercially available, according to the manufacturer.

Horizontal automatic feed is standard equipment along with the vertical feed. Attachment for cutting threads up to 1½ in. is optional.

All electric equipment is located in the head for easy access.

An auxiliary motor has been added to raise the head during setups.

Dist by Electro-Spark Co, Inc, 23 E 26th St, NY 10, NY

MORE DATA? Circle 67, inside back cover

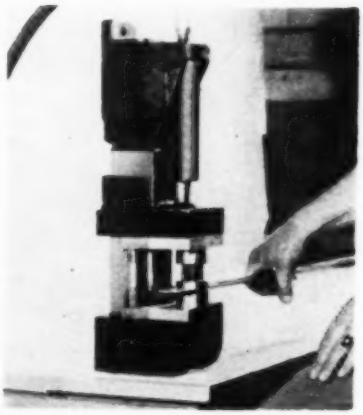
Denison Introduces New Multipress Line

Series S hydraulic Multipresses, in capacities from 3 to 8 tons, are available with manual or automatic controls and are designed for use with Denison 6 or 12-station indexing tables.

Principal features of these self-contained bench units are larger bed, more rigid frame, more knee room, and an easily accessible adjustable relief valve to give adjustment of ram pressure. Units have pushbutton gage valve for quick pressure reading and longer gage life, a newly designed cylinder for faster operating speeds, and a quick-adjusting inch and stroke change control. Over-all height without bench is 49¼ in.; weight is approx 1300 lbs.

Denison Engineering Div, American Brake Shoe Co, 1160 Dublin Rd, Columbus 16, Ohio

MORE DATA? Circle 68, inside back cover



5-ton Hydraulic Vise Serves As All-Purpose Machine Tool

Portable 5-ton-capacity precision hydraulic vise has a demountable power unit that can be removed for use as a power jack or press. Vise may be used in the usual position or, on end, as a portable machine or permanent installation.

Attachments for converting the unit for a variety of uses fasten to the primary jaw with a chamfered lockpin which is automatically pulled tight by a chamfered Allen screw. Vise jaws open to 6 in., have throat depth of 3½ in., and are 4½ in. wide. Over-all length of the vise is 22½ in., weight 53 lbs. Standard detachable jaws furnished as part of the unit are 2 x 4½-in. waffle-faced steel plates. Model is foot-operated, with power pedal, control pedal, and release pedal. Pressure can be applied a pound at a time or can be brought to the full 10,000 lbs with three power pedal strokes.

Pipe or round stock jaw plate holds ¼ to 4-in. pipe, without scoring. The pipe bender, with the correct size set of forming wheels, will make any bend up to 45° in ¼, ½, or ¾-in. pipe. The sheet metal shear attachment will cut stock up to ⅝ in., and the die punch will punch up to a ⅝-in. hole in ⅛-in. steel.

Warn Sales Co, Riverton Box 6193, Seattle 88, Wash

MORE DATA? Circle 69, inside back cover

2,500 WATT ULTRASONIC IMPACT GRINDER can cut areas up to 3 1/2 in. in diameter in hard or brittle materials. Tool head vibrates at 20 kc and can hold tolerances of ±0003 in. Price is $16,800—*Raytheon Co, Waltham 54, Mass*

MORE DATA? Circle 70, inside back cover

Radiographs-

dry and ready-to-read in 13 minutes

KODAK INDUSTRIAL X-OMAT PROCESSOR

Now it takes only 13 minutes to process your industrial radiographs. The Kodak X-Omat Processor produces radiographs of uniform high quality . . . and it brings automation to your darkroom.

Exposed films are merely removed from their holders and fed directly into the processor. Film hangers are eliminated. And only 22 inches of the unit's 10-foot, 10-inch length need extend into the darkroom itself.

Kodak Industrial X-ray Films, Type AA and Type M—sheet films or continuous lengths—go through the system at the rate of 38 inches per minute.

This means time saved and costs cut. You should have the complete story. Send for the folder that gives all the details.

X-ray Division — EASTMAN KODAK COMPANY — Rochester 4, N.Y.

EASTMAN KODAK COMPANY, X-ray Division, Rochester 4, N. Y.

☐ Send the folder about the Kodak Industrial X-Omat Processor.

☐ Send the names of the Kodak Industrial X-Omat Processor dealers in my area.

Name _____

Firm Name _____

Firm Address (Street) _____

(City) _____ (Zone) _____ (State) _____

90-11

Mail this coupon for full information

Kodak
TRADE MARK

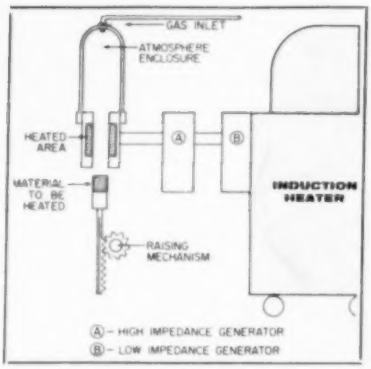
Turnover Cradle Speeds Handling Of Heavy Coiled Materials

This 20,000-lb-capacity unit which automatically rotates and palletizes rolls of coiled materials is said to offer six times the efficiency of previous methods of handling coils. Device permits stacking in a manner which saves a large amount of floor space. In addition, it eliminates egg-shaping and dangerous band breakage.

Coil is placed vertically on the cradle with a fork lift truck against the pallet. Then, in one operation, the cradle rotates 180° horizontally and 90° vertically. This motion palletizes the coil and rotates it so that, after being palletized, it faces the truck, ready for removal. Operation requires less than 20 seconds. Unit occupies about 35 sq ft of floor space and can be moved about by a 7000-lb fork truck.

La Deau Mfg Co, 2702 San Fernando Rd, Los Angeles 65, Calif

MORE DATA? Circle 71, inside back cover



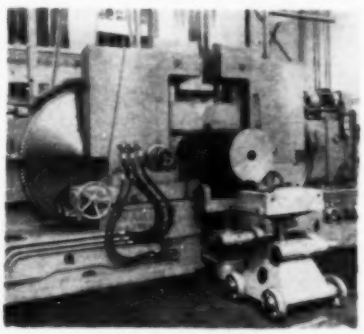
High-Frequency Induction Furnace Heats to 5000 F

High-frequency induction furnace can operate in an atmosphere of pure hydrogen or oxygen up to a temperature of 5000 F. Furnace uses zirconia and/or thoria pure oxide refractories as a heating element. Zirconia is heated by RF electrical energy from a 30-w, 10-mc RFC induction heater.

Unit can be converted into a low impedance output in five minutes for use in commercial applications. Fitted with a levitation coil, it will levitate and melt materials such as copper, gold, aluminum, silicon, titanium, titanium boride, boron, tungsten, hafnium, molybdenum, zirconium and cobalt. It can also be used for standard commercial soldering, brazing and similar operations.

Radio Frequency Co, 44-46 Park St, Medfield, Mass

MORE DATA? Circle 72, inside back cover



German Cold Sawing Machine Equipped With 2 Saw Blades

Gustav Wagner (German) Duplex WKD1600 cold sawing machine is designed to cut large rounds, squares, and slabs with less waste and lower tooling costs. It can be used on alloys, superalloys, and stainless steels.

The machine consists of two standard Model WK-1600 saw carriages mounted on a heavy base. The carriages have their saw blades opposing each other in the same plane and cut simultaneously from both sides of the stock. As both saws approach the center of the cut, one is retracted in rapid reverse while the other completes the cut. A positive automatic shifting arrangement prevents accidental contact of the two saw blades.

Each saw unit is controlled by a single-lever, selective, semi-automatic control system. With a 63 in. blade saw can cut 34 in. rounds and squares and 42 x 20 in. slabs. With a 71 in. blade saw can cut rounds and squares to 37½ in. and slabs to 42 x 20 in. Cutting speeds range from 6 to 72 fpm. Infinitely variable feed range is 0 to 16 in. for both carriages.

Dist by Albert Klingelhofer Machine Tool Corp, Industrial Park, Kenilworth, NJ

MORE DATA? Circle 74, inside back cover

MULTI-UNIT AUTOMATIC performs seven operations on 41 different anchor keys for aircraft brakes. Seven units drill and countersink at a gross rate of 140 parts per hr. A 30-in. index table holds eight work fixtures with manual clamping. Two vertical units on the left drill one hole and countersink top and bottom; two units on the right do the same for the second hole, but they have in-and-out adjustment because the center distances of the two holes vary. Second unit for each hole has an attachment that countersinks underneath. Same feed cam controls both tools to avoid clash *Kingsbury Machine Tool Corp, Keene, NH*

MORE DATA? Circle 73, inside back cover

WINNERS ON POINTS

Every material has machining characteristics which call for a little different drill point for best results.

For ordinary free machining steels standard 118° points are entirely satisfactory. Plastics machine best with a sharper angle, usually 90°. That tough, work hardening stainless steel requires a flatter (135°) split point to do a real job on it.

Whatever the material you are drilling, there is a best drill. May we send a GREENFIELD-AMPCO drill expert to discuss other points of interest to you?

GREENFIELD TAP & DIE

GREENFIELD, MASSACHUSETTS

HOLD IT WITH A HORTON

Round, square, hexagonal, or what shape have you. HORTON Independent Chucks with reversible jaws will hold it with a four jaw grip that's positive, true and reliable. A precision chuck for precision machining.

Capacities from 4 inches to 36 inches, in all standard mountings. Special chucks to 66".

HORTON, to be sure . . . . To be sure, HORTON

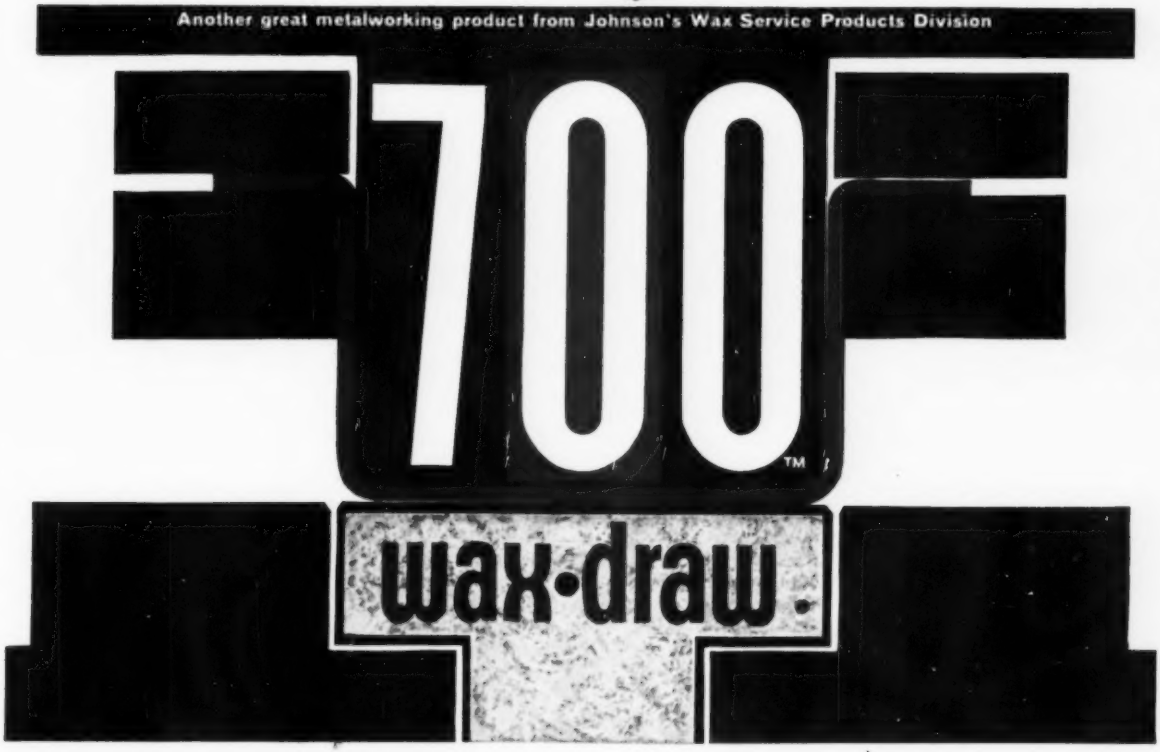
GEOMETRIC—HORTON NEW HAVEN 15, CONNECTICUT

For the deepest draws on the toughest metals

Johnson's 700 WAX-DRAW does every draw in the shop. *Easy to apply* by roller coating, spraying, dipping, etc. Use wet or dry. Blanks can be fed directly into the press or may be pre-coated, dried and palletized. *Easy to remove*, using solvent bath, vapor degreaser, alkaline washer or even hot water alone. *Money saving.* One gallon undiluted covers 2,000 square feet. Four-to-one dilutions produce excellent results. 700 Wax Draw handles multiple draws with only one application even at pressures to 200,000 p.s.i. and temperatures to 450°F.

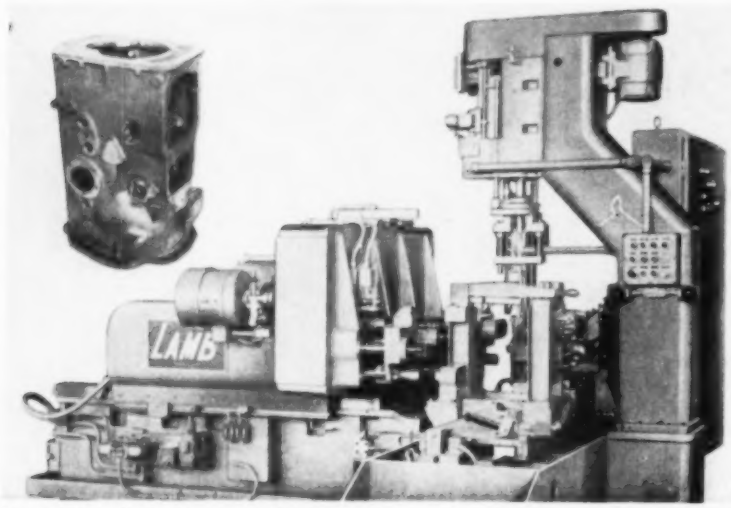
For further information write: **JOHNSON'S WAX** Racine, Wisconsin, Dept. **AM112**

Another great metalworking product from Johnson's Wax Service Products Division



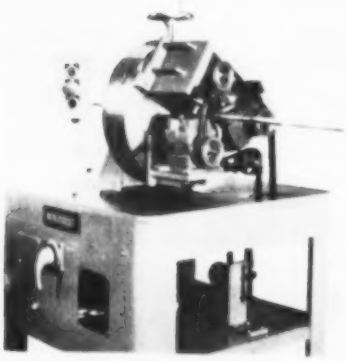
◄ CIRCLE 244 READER SERVICE CARD

CIRCLE 245 READER SERVICE CARD



TWO-WAY SHUTTLE MACHINE taps, chamfers, and reams horizontally and vertically on three faces of tractor transmission cases. A required production rate of only 38 pieces per hour permits shuttling the entire fixture and part, thereby simplifying machine design—*F Jos Lamb Co, Detroit, Mich*

MORE DATA? Circle 75, inside back cover



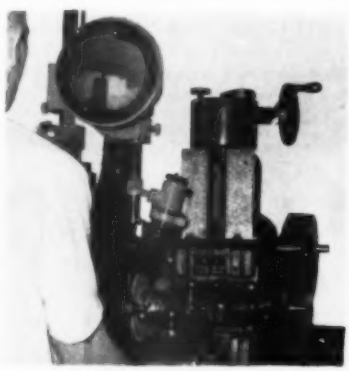
Machine Continuously Marks EMT on Aluminum Tubing

Noblewest Model 534 marks manufacturer's identity or other information continuously into aluminum electrical mechanical tubing.

Unit applies identical EMT markings permanently at 1-ft intervals along lengths of tubing in sizes from ⅜ to 2 in. OD. In addition, it also marks at three radial locations, 120° apart. Feed rate is variable from 175-350 fpm. Feature of the machine is the standard 18-in. scroll chuck with jaws modified to hold three roll die heads each of which takes a concave roll marking die. Marking dies are adjusted for various tube diameters by movement of chuck jaws. Special idler spindle and pulley automatically picks up belt slack caused by movement of the heads. Model is equipped with variable speed drive with jog, start, and emergency stop buttons.

Noble & Westbrook Mfg Co, Westbrook St, East Hartford, Conn

MORE DATA? Circle 76, inside back cover



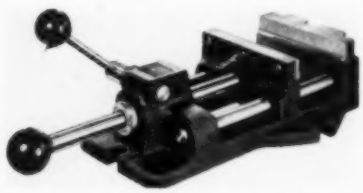
Optical Projector Designed For Attachment to Machine Tools

Portable projector permits continuous precise magnified checking, direct measurement and comparison of work contours to transparent overlay charts. Accessories include standard interchangeable magnifications of 10, 20, 31.25X; protractor screen; illuminators and mounting compounds for direct linear measurement to 0.001 or 0.0001 in. Unit can be carried from one application to another or permanently mounted on existing grinders, lathes, milling machines, or other machine tools.

Applications include circular and flat form tool grinding, production grinding of precision contours, regrinding of tools, dressing of critical wheel and tool shapes, precision locating of printed circuit points, monitoring of extruded wire insulation, and many miniaturization problems.

Stocker & Yale Co, 21 Green, Marblehead, Mass

MORE DATA? Circle 77, inside back cover



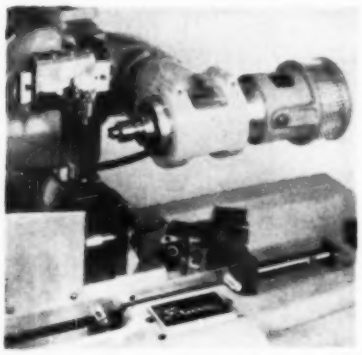
Line of Vises and Fixture Holders Available for Drillpress Work

Precision-built line that safely handles both rigid and non-rigid work without distortion is furnished in three sizes, 4, 6, and 8 in. Max openings are 5½, 6¼, and 8½ in. respectively.

Turn of the front adjusting screw bushing varies jaw pressure from 1 to 1500 lbs. Easy hand pressure on a hardened and micro-ground bar locks and holds the work. Heavy, removable jaw inserts permit simple, quick adaptation for lowcost jigs and fixtures.

L-W Chuck Co, S St Clair St, Toledo 4, Ohio

MORE DATA? Circle 78, inside back cover

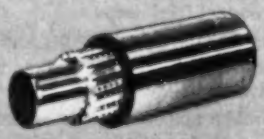


ALUMINUM SWITCH HOUSINGS are milled at 42,000 rpm to 0.001 in. tolerances for Cutler-Hammer on this unit. A similar machine mills plastic housings. The entire machining process is controlled from locating points on the housing, making a mechanical measurement dependent on an electrical actuator—*Precise Products Corp, Blue River Rd, Racine, Wis*

MORE DATA? Circle 79, inside back cover

New Bliss ball bearing die sets shrink hours into minutes in die making and changeover!

Here are seven reasons why...



- Negative clearance means longer die life. No die shifting. Misalignment is eliminated.
- Ball bearing construction speeds assembly and disassembly. Yet installation is conventional. Die builder doesn't work in reverse.
- Smooth even preloading prevents shock...assures alignment of punch and die. Off-set design reduces wear.
- Easy oiling and maintenance. Loosen the set screw, the retainer is out and back in minutes.
- Eliminates downtime caused by seized pins and bushings.
- Standard components—no need to stock or wait for specials.
- Existing sets can be easily and economically converted to Bliss-Dieco ball bearing design.

Mfd. under U. S. Pat. 2,311,815

Note: Bliss-Dieco ball bearing assembly can be stripped from guide post on inclinable or straight side presses.

Bliss' patented ball bearing die set has money and time saving advantages no other die set has—conventional or otherwise. It gives you more burr-free parts between regrinds... fewer rejects.

It's the most revolutionary change in bearing design to hit the die industry in years. Assembly and disassembly are a snap. Die making and tryout time are slashed. No more time lost because of seized pins and bushings.

Pre-loaded ball bearings provide *negative clearance* for perfect die register, even after millions of hits.

What's more, cleaning and lubrication are a matter of minutes with this unique die set: You just loosen the self-locking set screw, drop the bearing retainer, clean it, reposition it and tighten the screw again. Light bearing oil is all that's needed.

In short, with the Bliss ball bearing die set you get maximum die life—"cleaner" parts—fewer die breakdowns. For further information, write E. W. Bliss Company, Die Supply Division, 1400 Brookpark Road, Cleveland, Ohio. We'll be glad to send you an illustrated technical bulletin that will tell you how you can have ball bearing die sets at a surprisingly low cost or how you can convert your existing die sets to the new Bliss-Dieco design.

dieco
DIE SETS

E. W. BLISS COMPANY
DIE SUPPLY DIVISION
Cleveland, Ohio

CIRCLE 246 READER SERVICE CARD

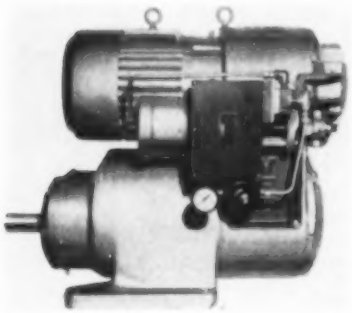
Truck Attachment Simplifies Handling of Steel Coils

Upending and rotating ram and fork attachment for use on heavy-duty electric trucks simplifies handling of coiled steel placed either flat on pallets or in an upright position.

Twenty-one separate hydraulic functions control the six major movements of a load. Capacity of the attachment ranges from 15,000 to 20,000 lbs. Truck operator can handle and stack coils in a normal ram truck fashion; rotate and upend a coil to place it flat on a pallet; remove a coil from a pallet and turn it for placement on a mandrel; and handle and stack palletized coils.

Yale & Towne Mfg Co, 11,000 Roosevelt Blvd, Philadelphia 15, Penna

MORE DATA? Circle 80, inside back cover



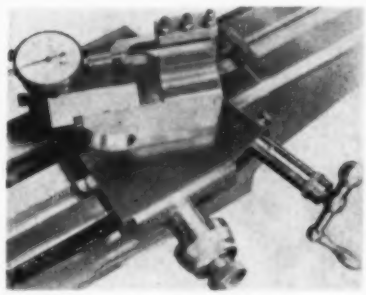
Lathe Drive Features Constant Speed Control

Packaged adjustable-speed lathe drive has closed-loop control for automatically holding cutting speeds. System consists of a mechanical variable-speed drive, automatic pneumatic control, three-way solenoid valve, position transmitter, manual-automatic control station, and filter regulators. It is available in sizes from ¼ to 40 hp, 1.7 to 4660 rpm, in 2:1 to 10:1 speed variations.

As the cutting tool cuts across the face of the part being machined, a pneumatic positioner receives an air signal indicating a change in working diameter and adjusts the output speed of the drive unit to correct spindle rpm. In addition to automatic control, the unit has a 3 to 15 psi gage to permit the operator to adjust the speed.

Reeves Pulley Div, Reliance Electric and Engineering Co, Columbus, Ohio

MORE DATA? Circle 81, inside back cover



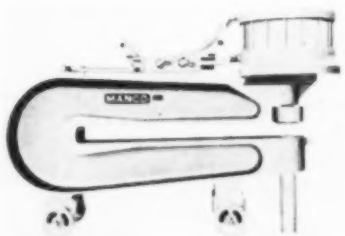
Radius Turning Attachment Has 3⅝-Inch Capacity

Radius turning attachment will machine concave or convex surfaces on the axis of the lathe by generating the surface with a single-point turning tool. The tool bit is set directly to the desired radius by taking the reading on a dial indicator graduated in thousandths. Feed is controlled by a worm and worm gear for positive, even feed.

Capacity is from 0 to 3⅝ in. diameter, either concave or convex. The beveled edge reads directly in degrees. Though designed primarily for the Wade No. 94 or 10-B, it can be adapted to other lathes.

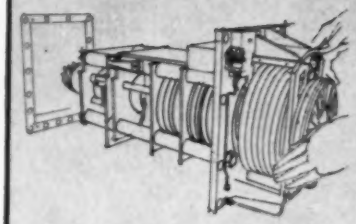
Wade Tool Co, ½ River St, Waltham, Mass

MORE DATA? Circle 82, inside back cover

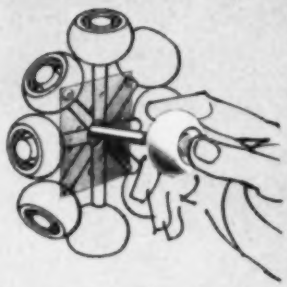


Metallurgical Punch Develops 6 tons of Thrust at 60 psi

By utilizing a large cylinder on its compact C frame, this new Manco punch will develop 6 tons of thrust at 60 psi and punch a 2½-in.-dia burr-free slug from steel strip ranging from 0.0045 to 0.025 in. thick. A 16-in.-dia bore tandem double-acting cylinder operates at 60 to 90 psi air.



Teletorque transmission—A completely new and advanced concept in power transmission. Coaxial design makes possible a compact machine that is more rigid and more productive. Constant-mesh gears are automatically "linked" in combinations which provide 32 table speeds through electromagnetic clutch brakes.



Directional "joy-stick" control—A magic circle "joy stick" at each control center speeds operation and eliminates fatigue. The tool goes the way the operator moves the stick. Increases skill and reduces learning time.

Fastest VTL

- 34", 42", and 52" sizes
- Broadest feed range
- Highest and broadest speed range
- Single dual-direction feed and traverse handwheel
- Circular scales and microdials
- Directional rail controls at the operator's station
- Fully gibbed rail—always level
- Counterbalanced heads
- Integral bed and column
- Least floor space
- Constant cutting speed available with a-c drive
- First VTL available with numerical control

Symbol for machining cost reduction

GIDDINGS & LEWIS

CIRCLE 247 READER SERVICE CARD

Photo courtesy The Chapman Valve Mfg. Co., Indian Orchard, Mass.

...change feeds and speeds "on the fly"
...eliminates stop-and-go machining

Here is a totally new kind of vertical turret lathe—the world's most compact, fastest, and easiest to operate! It's powered, constructed, and geared for highest cutting speeds to slash the cost of boring small holes, turning long pieces, and facing wide surfaces. All functions are actuated and controlled electrically with simplicity that saves hours of hard work and puts more parts on the floor at the end of the day.

You can change feeds and speeds while the tool is in the cut and the table is turning. Tool life, finish, and accuracy are improved because the operator always works at the right speed. Now you can capitalize on throwaway tooling, not only by increasing cutting speeds, but by eliminating stop-and-go machining.

With a G&L VTL minimum time is spent with the machine idle or cutting air. As a result, the operator spends more time doing productive work.

Controls are in an ellipse area for fast, easy operation. One-hand pendant control operates the table, including speed, start, stop, and jog. The machine is easy to get around, takes 30% less floor space than machines of comparable capacity.

For complete details and descriptive literature, call your Giddings & Lewis distributor or write directly to the factory.

GIDDINGS & LEWIS MACHINE TOOL COMPANY

Fond du Lac, Wisconsin

Giddings & Lewis manufactures: vertical and horizontal boring machines, vertical turret lathes, planers, planer mills, contour milling machines, die sinking machines, drilling machines, numerical and tracer control systems, boring tools and related items, and machine tool accessories.

CIRCLE 248 READER SERVICE CARD

Yes, you get split second coolant flow from the moment the machine is turned on. And Gusher Pumps are designed better for more efficient operation. They need no maintenance, no priming or packing. Ball bearings

Best of all they are

LOWER IN INITIAL COST, TOO!

Write for catalog

THE **Ruthman** MACHINERY CO.

1819 Reading Road, Cincinnati 2, Ohio

Coolant Pumps Circulators

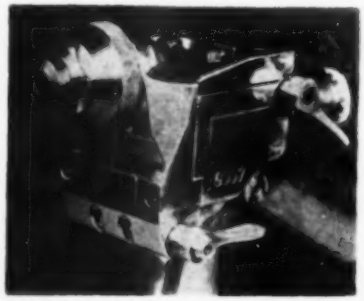
NEW SHOP EQUIPMENT

with self-contained spring stripper. Standing only 40 in. high, it rolls into a working position on its angle iron track either manually or by power. A 40-in. throat accepts the work. Over-all dimensions are 62 in. long x 40 in. high x 18½ in. wide. Weight is 1700 lbs.

Another model develops 8 tons of thrust at 55 psi, knocks out 3½-in. slugs, and has a 14-in.-dia bore tandem double-acting cylinder to operate at 55 to 75 psi air.

Manco Mfg Co, Bradley, Ill

MORE DATA? Circle 83, inside back cover



Metallizing Gun Applies Fine-Grain Coatings

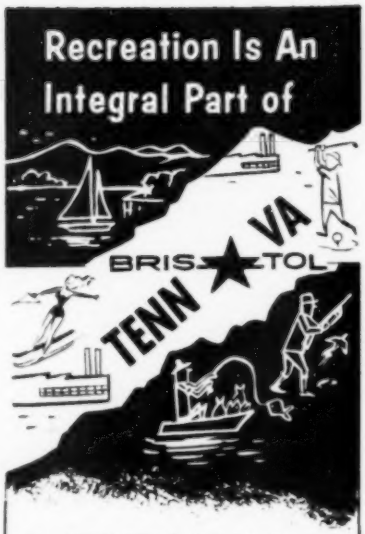
Lightweight metallizing gun, for production, maintenance or research work, is equipped with a two-position air cap that adjusts automatically for easy lighting and fast, fine-grain spraying.

Gun will handle wire sizes from 15 B&S gage to 3/16 in. of metals from molybdenum to lead. Dual-range air motor system feeds the wire at 1.32 to 23.1 fpm. Unit weighs 4½ lbs and uses 21 cu ft of air per minute.

SpraRod Corp, 2795 E 83rd St, Cleveland 4, Ohio

MORE DATA? Circle 84, inside back cover

"Now here's a good buy—if you're not sensitive to the biting sarcasm of your employees."



In OLD Industrial Country

Every manufacturer knows a happy employee is a good employee and Bristol, Tenn.-Va. has the happiest employees in the nation. And for good reason . . . They're living in the finest section in the world and they know it.

Bristol is in the foothills of the Appalachian Range, high, healthy and happy. The Tennessee Valley lakes, The Great Smoky Mountains and the famed Valley of Virginia are but a stone's throw away.

Bristolians are adept in taking advantage of their recreational facilities and sports and entertainment are an integral part of their daily lives.

You can relax and prosper in Bristol, Tenn.-Va. Come on down and let us show you how!

Let Ford, Bacon & Davis Tell You The Whole Story

This nationally famous engineering firm has prepared an exhaustive analysis of Bristol's industrial potential. Write for your copy today—Dept. M1159

Bristol

INDUSTRIAL DEVELOPMENT BOARD of the Twin Cities of

BRISTOL • TENN - VA

CIRCLE 249 READER SERVICE CARD

CIRCLE 250 READER SERVICE CARD

250,000 Power Tools per year with Cities Service Pacemaker T

Porter-Cable, one of the world's largest manufacturers of portable wood-working tools, has long known the value of quality in a lubricant as well as in a power tool. Each piece of equipment made by Porter-Cable is carefully pretested before manufacture and then continually tested for years after its original appearance on the market. It is this kind of thoroughness that led to Porter-Cable's choice of Cities Service Pacemaker 300 T as the hydraulic oil to power their Fostermatic Screw Machines and Landis Grinders.

But Cities Service Pacemaker T is more than a hydraulic oil . . . it is a multi-purpose line of lubricants suited for many applications. Porter-Cable also uses Pacemaker 300 T for lubricating valves in the plant's compressors. Pacemaker T can be used to lubricate bearings, diesel engines, electric motors, generators, reduction gear drives, turbines and in circulating systems.

Pacemaker T is available in various viscosities to give you one line of quality lubricants that can save costly warehouse space by simplifying your inventory . . . cut maintenance costs and extend equipment life. These oils have high viscosity index, excellent heat resistant properties and are chemically fortified against oxidation, corrosion, rust formation and foaming.

Contact your nearest Cities Service office and an experienced Lubrication Engineer will call to make specific recommendations for your plant on the use of Pacemaker T. Or for further information, write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

Porter-Cable Machine Company
Syracuse, New York

Porter-Cable Research Engineer testing engine for new lawnmower the company will produce soon. All new products undergo extensive research and testing before production.

Backbone of Production Line is Automatic Screw Machine. Pacemaker T gives outstanding performance as hydraulic medium in these machines as well as in Landis grinders and as a general lubricant!

CIRCLE 251 READER SERVICE CARD

Can you put your finger on machining economies like this?

Cost of 800 brazed single point tools at approximately $3.50 each

TOTAL $2,800.00

Cost of 100 square CARMET INDEXABLE INSERTS with 800 cutting edges at

APPROX. $100.00

In addition to these savings on machining, you gain in high production rates, longer tool life, in longer tool storage and inventory, as well as tool change downtime.

Over 9 styles and 109 sizes Carmet cadmium plated tool holders. 6 carbide grades for machining almost all materials from wood and plastics to high alloy steels.

then it's time to switch to

CARMET® INDEXABLE INSERTS AND TOOL HOLDERS

See your Carmet Distributor now—or write to Carmet Division, Allegheny Ludlum, Detroit 20, Michigan.

447

Write for New-Revised CATALOG C-16-8 CARMET CEMENTED CARBIDES FOR INDUSTRY

This 32-page book contains revised prices and complete specifications on Carmet's full line of cemented carbide tipped tools, blanks and holders. Speed and feed charts, grade comparisons and ordering information included.

ADDRESS DEPT. AM-23

CARMET

CEMENTED CARBIDE DIVISION OF
ALLEGHENY LUDLUM STEEL CORPORATION

FIELD REPORT...

USI Acquires British Firm

US Industries, Inc, has concluded arrangements for acquisition of Burtonwood Engineering Co Ltd of Lancashire, England, for an undisclosed sum. Transaction gives USI its first wholly controlled manufacturing business in the European market area. Burtonwood, with three plants in England and a subsidiary company in Venezuela, has in excess of 200,000 sq ft of manufacturing space under roof, employs 1000. Company makes a broad range of products in the oil field equipment line, automotive, plastics, and material handling industries.

Universal Grinding Expands

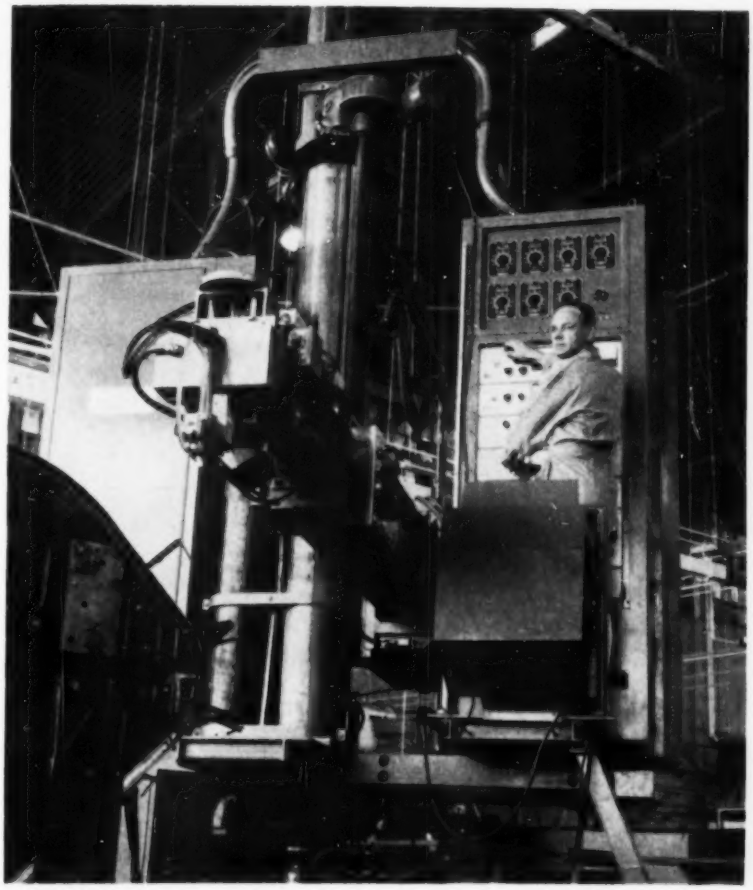
Second expansion in the past year is going on at Universal Grinding Corp, Cleveland. Company is putting up a 27,000 sq-ft addition next to its present 23,000 sq-ft plant acquired in 1958. Firm presently has 95 production grinding machines in operation and, when the new building is completed, will add another 25 units. Services include 15 types of grinding operations with equipment that ranges up to a 240-in. external grinder that will produce a mirror finish on cylinders and rolls up to 20 ft long and 3 ft in diameter.

$188.4 Million Contract . . .

. . . has been awarded by the Army to Western Electric Co for continued research and development work on the Nike-Zeus anti-ballistic missile system. Company is a senior member of the industry team that developed the Nike-Ajax and Hercules anti-aircraft missiles. Work on the new order will be carried out at the following plants: Bell Telephone Laboratories, Whippany, NJ; Western Electric Co, Burlington, NC; Douglas Aircraft Co, Santa Monica, Calif; Goodyear Aircraft Co, Akron, Ohio; Lear Inc, Grand Rapids, Mich; Sperry Gyroscope Co, Great Neck, Long Island; Burnes & Roe, New York City; Remington Rand, Univac, St Paul, Minn; and Continental Can Co, Coffeyville, Kan.

Dumore Acquires Master Mfg Co

Master Manufacturing Co, Hutchinson, Kansas, specialist in the building block component type of machine tool, has been taken over by Dumore Co, Racine, Wis, manufacturer of portable precision tools for milling, drilling, and grinding ferrous and non-ferrous metals, plastics, and glass. Dumore, which operates principally in the industrial supply field, plans to operate Master in the machine tool field.



Fusion welding with TV . . .

Closed-circuit television monitors [illegible] in this custom-made automatic fusion welder [illegible] at American Aviation's Los Angeles Division where it is used in manufacture of welded subassemblies for the B-70 intercontinental bomber. Weld head is mounted on a boom which provides 10 ft of usable weld and rotation of 360°. This is one of several such machines for fusion welding of high-strength, thermal-resistant alloys for the B-70

American Motors' High

All-time-high sales record for an independent automobile manufacturer has been chalked up by American Motors Corp. Ramblers delivered in the 1959 model year toted 351,317 —just 128% over the profitable figure achieved in 1958.

Cooper-Bessemer to Buy Rotor Tool

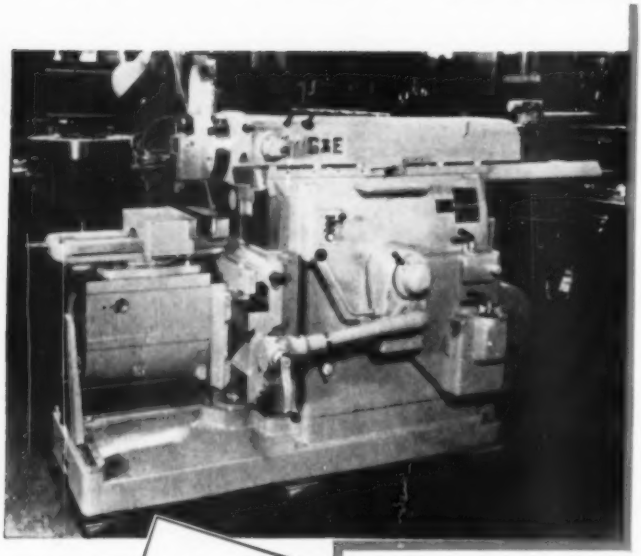
Cooper-Bessemer Corp, Mount Vernon, Ohio, producer of reciprocating and centrifugal compressors, heavy-duty power engines, and automatic control systems, is planning to acquire Rotor Tool Co of Cleveland through transfer of stock to Rotor. Company which will be operated under its own name as a C-B subsidiary, makes air-powered grinders, buffers, nutsetters, impact wrenches, chippers, and specialty tools.

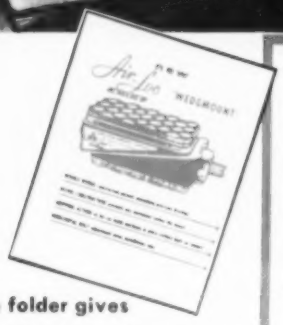
Siegler Sets Up Metallurgical Lab

New metallurgical laboratory designed for analysis of space age metals has been established at Siegler Corp's Hufford Division, El Segundo, Calif. Lab contains the latest in physical property testing and research equipment plus research heat treating apparatus. It'll enable Hufford to evaluate exotic uses of newer metals employed in such items as pressure vessels and rocket motor cases. Facility will also be used for

Can You Hold Your Shaper Without Bolts?

YES- with new **WEDGMOUNT** which anchors Shapers, Presses, etc. *and* permits precision leveling!





This Gould & Eberhardt 24" Industrial Universal Shaper, operating at 120 cuts per minute with a 4" stroke, is installed without bolts on a new type machinery mount called WEDGMOUNT. A dial indicator at the base of the shaper showed a total oscillation of only .022" during operation, and no "walking." The 7,800 lb machine is installed on six WEDGMOUNTS, each type 3" x 6" S. Before operation, precision leveling is achieved by simple adjustment of a bolt within each mount. Top and bottom of each mount is surfaced with patented "Air-Loc" pads, which provide the high degree of friction required to hold the machine in place despite its strong lateral thrust, and greatly reduce transmitted vibration.

Free folder gives complete facts about

WEDGMOUNT with—

"Air-Loc" patented vinyl, sisal and cork pads top and bottom grip machines to floors

•

double-wedge construction which permits immediate precision leveling

•

keyed construction which prevents movement *within* the mount

•

sizes available thru distributors, and prices

Air-Loc® WEDGMOUNT

write to... **Clark-Cutler-McDermott Co.**

100 West Central Street • Franklin • Massachusetts

Field Report . . .

further development of the Hufford Spin Forge process and its application to missile hardware and assemblies.

Bethlehem Gets Ship Order

Bethlehem Steel Co's shipbuilding division at San Francisco has a $27.3 million contract from Pacific Far East Lines for construction of two cargo vessels. Both will be Mariner-type, 14,000 deadweight tons, with speed of 20 knots. Low bidder for the contract was Bethlehem's Sparrow Point, Md, shipyard but the western yard got the job under the federal law allowing 6% contract differential on bids by Pacific Coast companies.

Barker Engineering Co Sold

F Hohlfelder Co, Cleveland, has taken over ownership and operation of Barker Engineering Co (same city). Barker name will be continued and company will operate as a division of Hohlfelder which manufactures a variety of metal products sold principally to the rubber industry. Barker makes bench and floor milling machines.

Company Formed for Blow Molding

Delman Co, Detroit producer of automotive specialties, and Vantines Inc, New York plastics manufacturer, have organized the Delman-Vantines Blow Molding Corp to produce molded plastics parts for the automotive and allied industries. Company officials report that through use of the technique die costs may run as much as 80% lower than in injection molding because air takes the place of the usually expensive male die.

"I know your kind, Quenton. If you could find a better job at twice the pay, you'd jump at it!"

Only new

TURCOAT

LOW TEMP PHOSPHATING

gives you up to 200 mg/sq. ft. of zinc phosphate coating in 2 short minutes at 95° F.

The Turcoat low temperature phosphating process provides permanent paint adhesion when used at an economical, easy-to-maintain temperature of 95°F. This temperature is *lower* than that required by other "cold" phosphating processes. It is up to 75° *lower* than temperatures required by conventional phosphating processes. You save up to 75% in steam, water, electricity and downtime costs alone!

As a base for paint, the Turcoat low temp phosphating process provides a uniformly smooth coating of up to 200 mg/sq. ft. in two minutes at 95°F. **As a base for corrosion prevention,** it provides an 1100 mg/sq. ft. coating in just eight minutes at 95°F.

Turco has waited to announce low temperature phosphating until it was thoroughly perfected and proven, through exhaustive field testing, to be the very best. For this reason, you'll find that with this new process, just as with Turco's hundreds of other cleaning and chemical processes, you are assured of trouble-free operation, ease of control, and dedicated technical service...anytime, anywhere! Write today for the full story of Turcoat low temperature phosphating, along with Turco's phosphating reference chart. There's no cost ... no obligation.

TURCO PRODUCTS, INC.
24600 South Main Street, Wilmington, California

Please send full details on Turco's new low temperature phosphating process and Turco's phosphating reference chart, without cost or obligation.

NAME _____ TITLE (OR DEPT.) _____

FIRM _____

ADDRESS _____

AM

TURCO PRODUCTS, INC.
Chemical Processing Compounds
24600 South Main Street, Wilmington, California
FACTORIES: Newark, Chicago, Houston, Los Angeles, London, Rotterdam, Sydney, Mexico City, Paris, Hamburg, Montreal, Manila, Naha (Okinawa)
Manufactured in Canada by B. W. Deane & Co., Montreal
Offices in all Principal Cities

ALLEN

ALLEN is the dowel pin that gives you PLUSES!

Your ALLEN Industrial Distributor can show you a good many ways to use ALLEN Dowel Pins, in addition to conventional uses in tool and die work. You can use them as economical roller bearings, axles, precision plugs, hinge and wrist pins—and in many other ways.

You can cut the cost of your product substantially, too—because your ALLEN Distributor can supply these strong, accurate, mirror-finished Dowel Pins in standard sizes right from stock.

Made of special Allenoy steel; surface hardened to 62-64 Rockwell C; precision ground to .0001" with micro-inch finish of 6 RMS max. Check your Allen Handbook or Catalog for detailed specs and standard sizes, or write direct for samples and technical information.

Genuine ALLEN products are available only through your ALLEN Distributor—he's always ready, willing and able to give you prompt, practical service.

ALLEN MANUFACTURING COMPANY
Hartford 1, Connecticut

ALLEN HEAD HEX-SOCKET SCREWS

Field Report . . .

Elimination of the high pressures commonly used in injection molding (in blow molding, air pressure used is only 80 lbs) is also a factor in cost reduction. Headquarters of the new company are in Flushing, NY.

Sommerfeld Machine Co . . .

. . . Braddock, Penna, has been purchased by John F Casey Co of Pittsburgh. Company, which will be operated as a subsidiary, is engaged in contract machining, manufacturing, and machine tool rebuilding. Machining facilities of Sommerfeld will be combined with the shop, fabrication, and machining facilities of Casey, general contractors.

New Taylor Fibre Division

Taylor Fibre Co, Norristown, Penna, has organized an Advanced Materials Division to investigate and develop laminated plastics and vulcanized fiber specifically for use in rockets, missiles, jet aircraft, and nuclear reactors. It'll operate independently of other divisions but will have access to the company's laboratory and production facilities. It is set up to work on R&D contracts for government and other outside organizations in addition to company-initiated projects.

Formsprag Acquires O S Walker Div

The Rawson Division of O S Walker Co, Worcester, Mass, has been bought by Formsprag Co and operations have been transferred to Formsprag's Detroit area plant. Newly acquired Rawson centrifugal clutch fits in with Formsprag's line of sprag clutches which perform over-running, backstopping, and indexing functions. The two are used in combination in many applications.

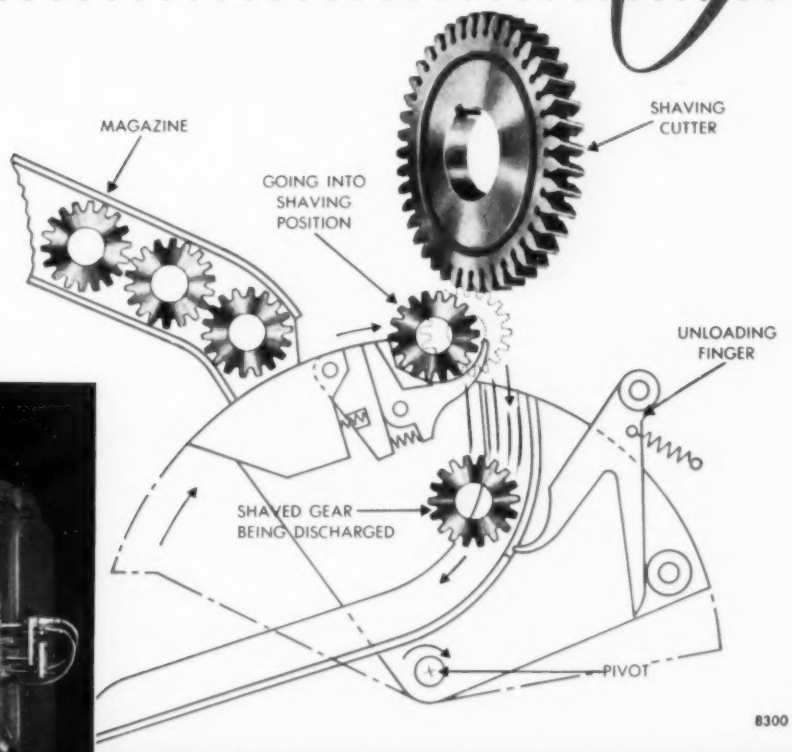
(Continued on p165)

"Jenkins, I accept your drawing without any revisions. Jenkins? Jenkins?"

WHY SETTLE FOR ONLY 75%

OF THE PRODUCTION YOU CAN GET WITH

AUTOMATIC GEAR SHAVING



RED RING ROCKER-TYPE AUTOMATIC LOADER
(PATENTED)

Production you can expect from automated gear shaving is determined by the type of automatic loader you use.

You get maximum production when the loader moves a gear from the magazine into shaving position and discharges its shaved predecessor — **all at the same time.** This assures maximum cutter operation.

If, on the other hand, the loading of a fresh gear has to wait until the previous gear has been discharged, shaving is delayed and you get only about 75% of the production you could otherwise expect.

The standard Universal Red Ring Gear Shaving Machine may be automated for MAXIMUM PRODUCTION — and without any major revisions in its design. Write for details.

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING,
GEAR HONING AND ELLIPTOID

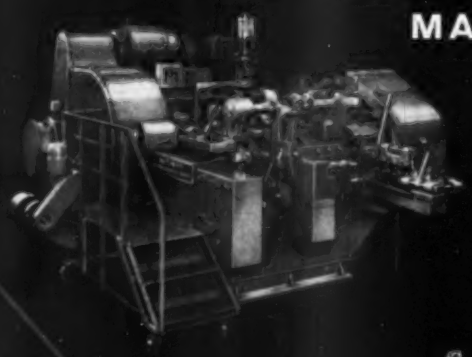
NATIONAL BROACH & MACHINE CO.

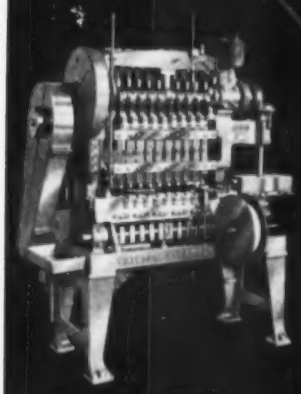
5600 ST. JEAN • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

CIRCLE 257 READER SERVICE CARD 163

COLD HEADING
MACHINERY





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DIVISION OF TEXTRON INC.
Waterbury, Connecticut • U.S.A.
Sales Offices: Chicago • Cleveland • Los Angeles • Millburn, N. J.

WF 55

Field Report . . .

All-State Welding Triples Capacity

Production capacity for spooled aluminum wire is being tripled by All-State Welding Alloys Co, White Plains, NY. Company can now spool, on 1 and 10-lb spools, every type of aluminum used for welding. New machines are being added to the home plant and at the western facility in South Gate, Calif. Next step in expansion program is spooling of various grades of copper wire, such as deoxidized copper and silicon bronze. Company also plans to handle magnesium, stainless, and mild steel wire.

Crane Buys Chapman Valve

Crane Co of Chicago has purchased all properties and assets of Chapman Valve Manufacturing Co, Springfield, Mass. Acquisition will provide Crane with manufacturing facilities in the eastern section of the US, something it hasn't had since 1941 when its Bridgeport, Conn, plant was sold. Facility will retain its own name and will be operated as a Crane subsidiary.

Physical Sciences Laboratory . . .

. . . will be set up by Melpar, Inc, Falls Church, Va, subsidiary of Westinghouse Air Brake Co, engaged in research, development, and production of electronic equipment. Three operational sections have been established. Molecular Electronics will deal with R&D and fabrication of molecular circuity systems now emerging from the experimental stage at Melpar. Through application of original concepts and techniques, it will synthesize molecules with unique properties in order to provide new materials that will be

"Boy! What a day! Tossed and turned all afternoon!"

ONLY

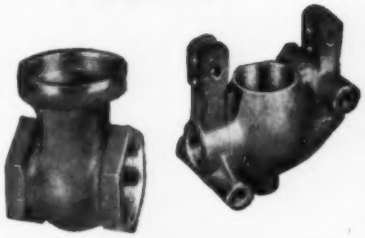
GOSS *and* DELEEUW AUTOMATIC CHUCKERS

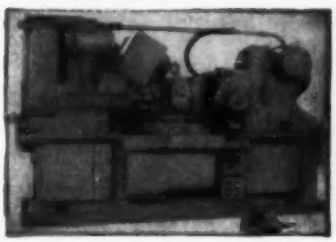
offer the 1-2-3 feature

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

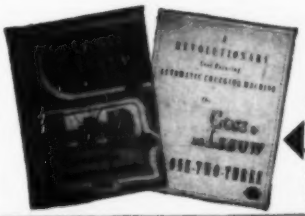
The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.





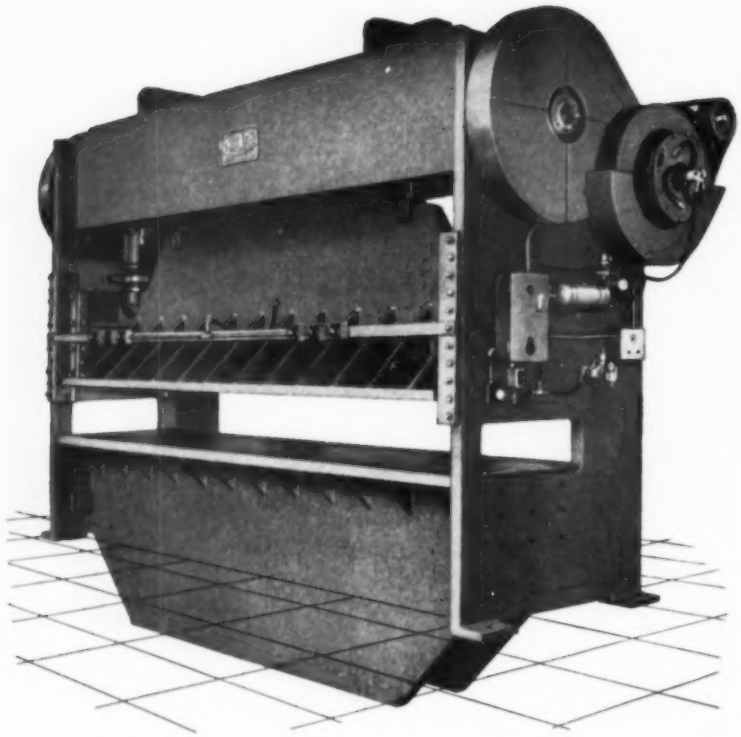
The examples of work shown here are typical of the wider variety of parts being produced on these new machines.



SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS *and* DE LEEUW
MACHINE COMPANY, *KENSINGTON, CONN., U.S.A.*

CIRCLE 259 READER SERVICE CARD



CHICAGO DREIS & KRUMP

PRESSES
STRAIGHT-SIDE TYPE

large die area
capacities up to 400 tons

This is a typical model of CHICAGO straight-side-type presses used for multiple punching, notching, and trimming operations. This press with a die area of 48 inches by 198 inches has a capacity of 200 tons.

Complete recommendations for any job on request.

6674

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies
Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP MANUFACTURING CO.
7434 South Loomis Boulevard, Chicago 36, Illinois

Field Report . . .

required for the space age. Chemistry section will continue its work in the chemical aspects of improved materials for electronic applications. Physics section will cover research and investigation of new solid state materials, development of high temperature measurement techniques, and plasma physics research.

$24 Million Order to Martin Co

Martin's Orlando, Fla, division has contract for continuation of engineering services and certain other technical activities on the Pershing solid propellant surface-to-surface missile system.

Thompson Ramo Wooldridge . . .

. . . has added a fourth member to its Commercial Electronics Group with acquisition of controlling interest in Magnetic Recording Industries, New York producer of electronic equipment for educational purposes. Company will continue to operate autonomously as a TRW subsidiary.

Zierden Buys Vilter Line

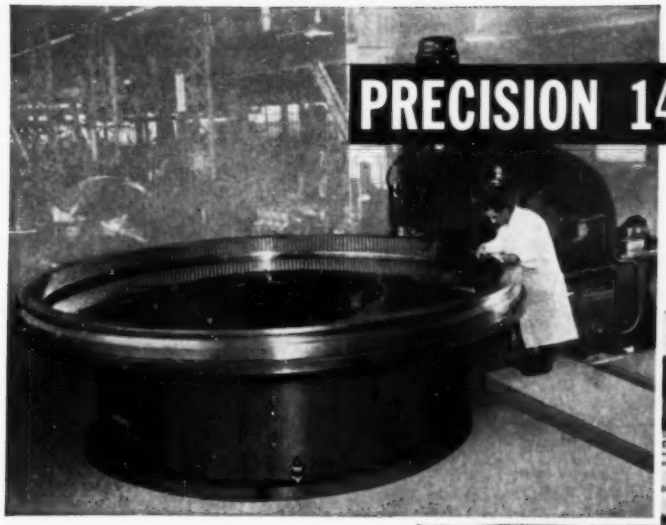
E F Vilter Co, Milwaukee, has sold its line of machine tool attachments to Zierden Co, same city. Attachments are marketed under the Tru Hole trademark. Zierden manufactures a line of turret heads used primarily with engine lathes.

H K Porter Adds New Division

Peerless Electric Co, Warren, Ohio, is now the Peerless Electric Division of H K Porter Co, the fourteenth of the Pittsburgh-based company's divisions. Peerless makes electric lamps, electronic devices and controls, fans, blowers, and motors.

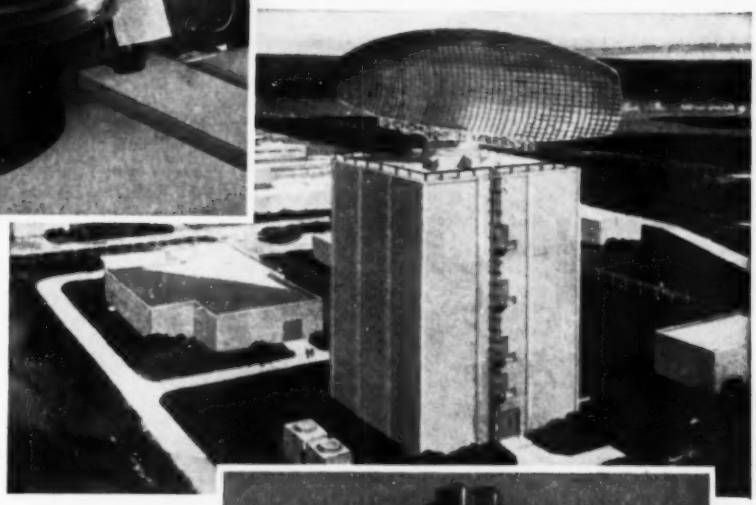
(Continued on p168)

"Hendricks has finally come to the age of metal . . . gold in his teeth, silver in his hair, and lead in his pants."

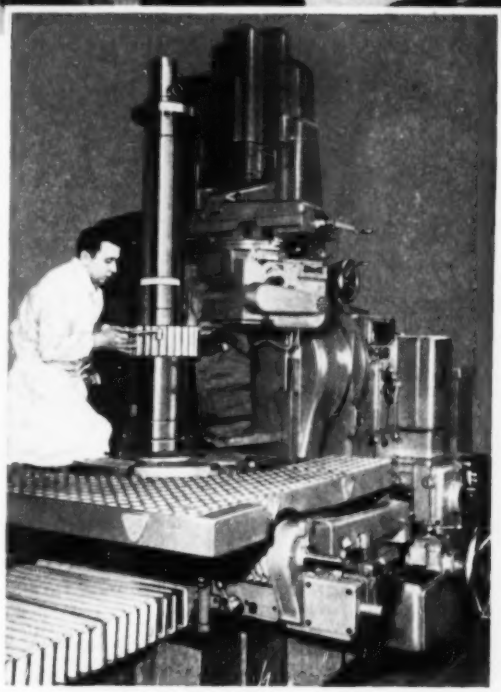


PRECISION 141″ INTERNAL GEAR

by PHILADELPHIA



. . . WILL REVOLVE THIS 70 TON AIR-SEARCH RADAR ANTENNA ASSEMBLY ➡



Where precision gears are required for defense or industry—Philadelphia has the equipment and manpower to do the job efficiently and economically.

The 141″ internal spur gears recently furnished for traversing the large Radar Screens on this fortress-like tower shown above were manufactured to the most critical accuracy requirements. The equipment will become part of Continental Aircraft Control and Warning System which searches out and identifies cruise-type missiles and aircraft through an intricate network of Air Force Radar Installations.

These five story towers, housing a complex electronic system designed and manufactured by the Sperry Gyroscope Company, are an integral part of the SAGE Complex.

The drive mechanisms furnished by Philadelphia Gear incorporate perhaps the most accurate large internal gears ever manufactured. The 141″ gears, having 282 teeth, are accurate within 20 arc seconds (17/1,000,000 part of circle) and the hardened and ground tooth pinions also manufactured by Philadelphia are accurate within 10 arc seconds (8/1,000,000 part of circle).

Where reliability and accuracy are required in precision or industrial gearing—you can depend on Philadelphia Gear for the best.

phillie gear®

PHILADELPHIA GEAR CORPORATION

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

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INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

Virginia Gear & Machine Corp. • Lynchburg, Va.

BISCA is the *Basic File* for cutting metals and costs

DELTA BISCA FILES

- Have unique tooth structure designed for fast cutting
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- Last up to 40% longer than other files
- Cut Brass, Iron, Steel, Copper, Aluminum Alloys and even tough Plastics with equal efficiency
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That's why Bisca is the Basic File for you.

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Field Report . . .

Ford Pushing Space Work

Ford Motor Co's Aeronutronic Division is opening a new office in the Boston area for advanced R&D work in space sciences, astrodynamics and range instrumentation. Facility, which will be assigned to the Division's Range Systems Operations, will be staffed by engineers and scientists, including astrodynamicists, mathematicians, numerical analysts, analytical physicists, and analytical engineers. Opening of the Boston unit (area was selected because it's a major electronics center) is result of company's plans to expand its activities in the space field. Meanwhile Division is continuing construction of a $22 million engineering and research center on a 200-acre site at Newport Beach Calif.

Aluminum Co of Canada Ltd . . .

. . . reports that aluminum from its Kitimat smelter may be shipped to Japan under a 15-year contract signed with Kobe Steel Works. Aluminum Ltd will supply Kobe with technical assistance in fabricating products in Japan; in exchange, the Japanese plant will buy all of its aluminum requirements which cannot be filled there from the Canadian company. Kobe hopes to double present output of about 10,000 tons per year.

Pyromet's Exotic Metals Furnace

Pyromet Co, South San Francisco, has developed a versatile high-vacuum furnace for brazing and heat treating of components made of titanium, beryllium, zirconium, molybdenum, tungsten, tantalum, and columbium. Cylindrical furnace is 24 in. high with a 24-in. diameter. It can handle small as well as large jobs at a higher vacuum; presssure is reduced to 0.001 micron.

Kaiser Aluminum Develops Process For Continuous Slab Casting

Kaiser Aluminum & Chemical Corp, Oakland, Calif, has developed a new process and equipment for continuous casting of aluminum slabs which permits the company to supply products, such as impact extrusion stock, at substantial savings in material costs to fabricators.

Development enables production of K-Slab with close dimensional control at high speeds in a variety of thicknesses, widths, and lengths. Both K-Slab and slugs blanked from it can be supplied to impact ex-

truders where a cast metal structure is acceptable. Kaiser also supplies a variety of alloy sheet slugs and rod-type slugs. Production tests show that the slugs are suitable for a wide range of thin and heavy wall tubes, cans, containers, and many electrical, automotive, aircraft, and industrial impact parts. Development work is in progress on casting various alloys and on processes permitting casting of thicknesses down to a quarter of an inch.

Chrysler Expansion in Holland

Chrysler will start assembling of passengers cars and trucks within the next couple of months at the newly acquired Rotterdam plant (formerly Kaiser-Fraser) where, up to the present time, Chrysler in cooperation with Simca assembled Simca cars. New assembly lines are being built to make the Chrysler, Dodge, and DeSoto cars and trucks. Maximum daily capacity will be 52 units: Simca 35, Chrysler passenger cars 15, trucks 2, an annual production of 13,500 vehicles. The Antwerp factory will be used as a parts warehouse serving Europe, the Near East, and North and Central Africa.

Thermal Dynamics Corp . . .

. . . new electronics concern, has moved into the former Split Ballbearing plant in Lebanon, NH. Company specializes in the development of the plasma torch for use in welding and aerodynamic heating.

Prenco Moves to New, Larger Plant

Prenco Products, Inc, producer of metal-oxide and plastic sealants for impregnation of castings, and Prenco Manufacturing Corp, maker of impregnation machinery, have moved

"We have no trouble living on my salary. My wife thinks I'm the janitor here."

DI-ACRO ROD PARTER cuts off 3,250 pieces/hr. for Geometric Stamping Co.

Donald Boyd, methods engineer, shows parted stock and the formed part, handle for material handling equipment

About 1½ million pieces of bar stock are parted off each year on a Di-Acro Power Rod Parter at the Geometric Stamping Co. Div. of Euclid Stamping Co. in Cleveland. Twenty-foot lengths of 5/16″ cold drawn steel are cut to 7″ pieces at a rate of 3,250 pieces per hour.

"Instead of investing in a single purpose punch press die," says Donald Boyd, methods engineer, "We picked the power parter for its versatility. On this job and a variety of other work the power parter has increased production two times—it's actually twice as fast. Incidentally, there has been little or no maintenance other than periodic lubrication and resharpening of die heads."

For your bar stock up to ⅝″ in diameter, investigate the Di-Acro Rod Parter. Speedmatic gauge cuts as fast as operator can feed. Minimum distortion—pieces can be threaded without de-burring. One standard die cuts eleven sizes. Special square, hex and other heads.

DI-ACRO HAND OPERATED ROD PARTER

Same size-range and accurate parting as power parter. Ejectomatic gauge automatically clears die after each cut.

For free booklet, "Handy Guide to Rod Parters," consult yellow pages under Machinery—Machine Tools for your nearest Di-Acro distributor or write us.

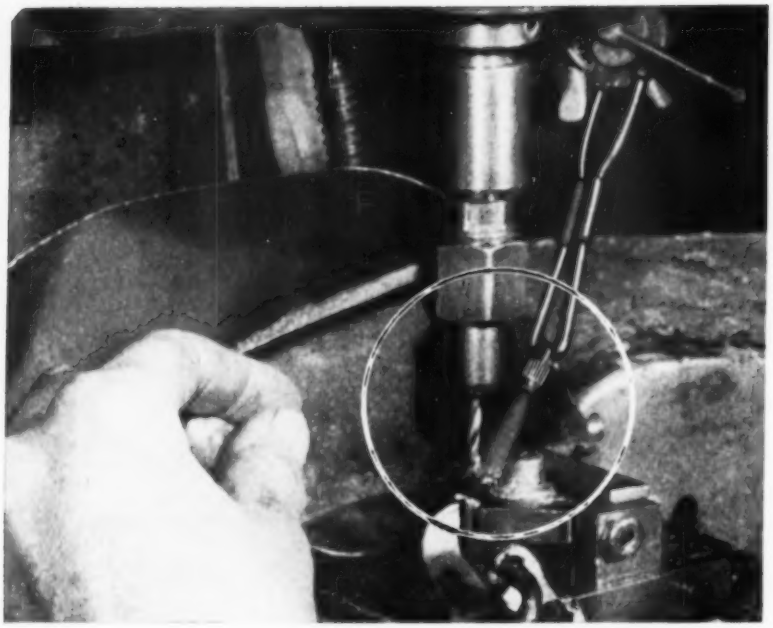
Find Us Fast in The Yellow Pages

pronounced die-ack-ro

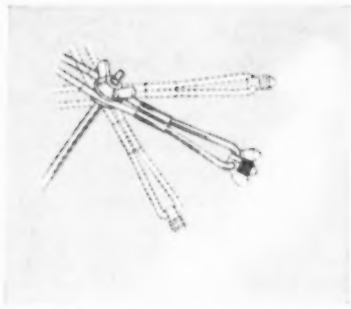
di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MFG. CO.

405 Eighth Avenue • Lake City, Minnesota



$40 mist-spray cooling outfit lets you hold closer tolerances



Swivel tip directs fine mist spray into the critical point of cut.

Multi-Misters available with one- or five-gallon tanks, one to four nozzles.

When cutting-tool heat plays havoc with tolerances, control it *effectively* with the DeVilbiss Multi-Mister.

Multi-Mister's jet of expanding air dissipates tool heat instantly; its spray mist lubricates cutting edges to reduce friction.

The results are a matter of record. For, in actual use, the Multi-Mister has made possible greater machine speeds, finer surface finishes while holding closer dimensional tolerances —with fewer shutdowns to sharpen and reset tools. And it often doubles tool life! Complete outfits start at $40; attach quickly and easily to any machine.

Call your DeVilbiss supplier, today, for full details; or write us direct for Multi-Mister Bulletin BC 1025.

THE DEVILBISS COMPANY
Toledo 1, Ohio
Barrie, Ontario • London, England • São Paulo, Brazil
BRANCH OFFICES IN PRINCIPAL CITIES

FOR BETTER SERVICE, BUY
DEVILBISS

Field Report . . .

from Hazel Park, Mich, to a new plant in Royal Oak. Facilities will enable the organization to meet broadening demands for fully automated custom impregnation machinery. In addition to impregnation service activities, firm also offers an equipment rental plant for castings users who prefer doing their own impregnation.

Fawick Forms New Division

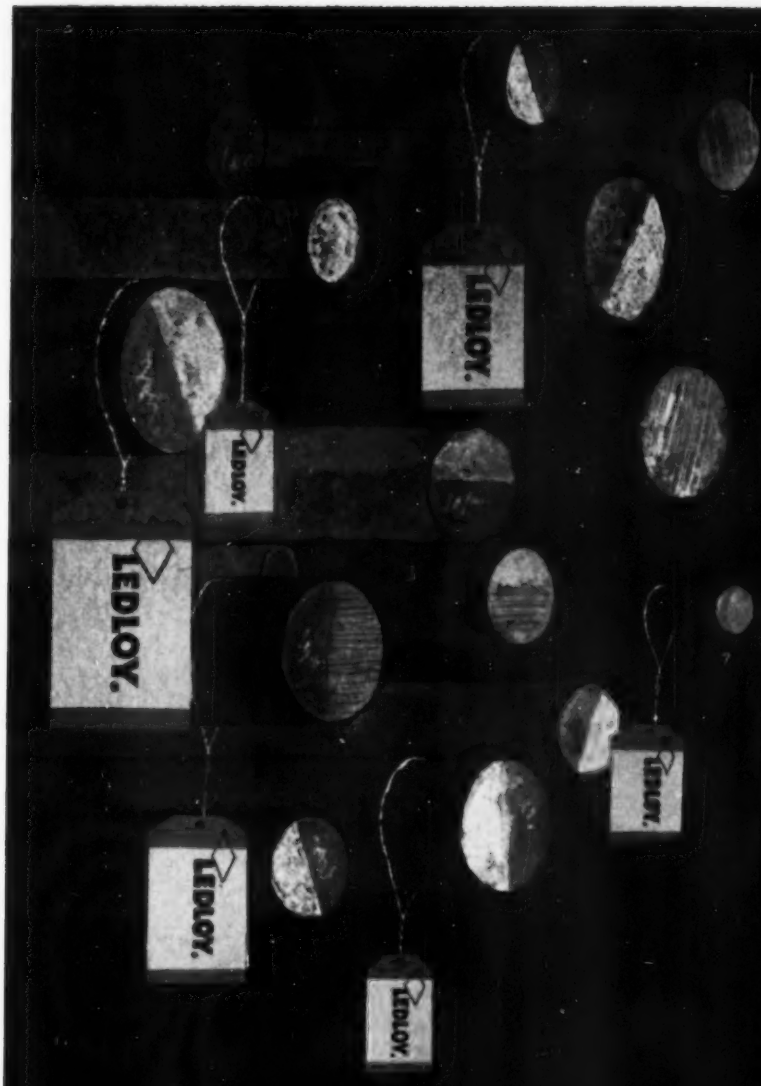
New Hydraulic-Electronic Division has been established by Fawick Corp, Cleveland manufacturer of industrial and automotive clutches and brakes. Entry into the field of hydraulic components has been brought about through acquisition of New Products Corp, Skokie, Ill, producer of hydraulic power steering valves, flow divider and relief valves, hydraulic pumps, fuel pumps, and other products for the precise control of fluid power. Development activities and limited production will be continued at Skokie until the early part of November, then key personnel and equipment will be transferred to Cleveland.

Budd Adds Two

Budd Co, maker of railway and automotive products, has purchased the business of Lewyt Manufacturing Corp, Long Island City, and has completed an agreement to take over the Cleveland Welding Division of American Machine & Foundry Co. The Lewyt firm produce data processing systems and electronic controls and measuring equipment; it'll be operated as a subsidiary called

(Continued on p173)

Say, Charlie, how is it you manage to be the first one to punch out every night?"



NOT ALL LEADED STEEL IS MADE BY INLAND...

BUT...

we've made more of it than anyone else . . . in fact, the first experimental heat and the first production heat of leaded steels were made in Inland furnaces.

Since then, more than 20 years ago, we've never stopped probing, refining, perfecting the process. And today we offer INLAND LEDLOY*—the leaded steels of highest quality, uniformity and dependability—the standard against which all other free machining steels are compared!

If you have any question about leaded steels . . . if increased machinability, higher speeds and feeds, easier tolerance control, greater production per tool change and fewer finishing operations sound good to you . . . we suggest you come to Inland . . . makers of LEDLOY, the original leaded steel.

INLAND LEDLOY steels are available in a wide range of standard carbon and alloy grades in bars or plates from your Cold Drawer or Steel Service Center. See them for LEDLOY and write to Inland for the booklet, "Properties of Inland Ledloy Steels".

*Reg. Trade Mark

LEDLOY *the world's most machinable steels!* INLAND STEEL *30 West Monroe Street · Chicago 3, Illinois*

INLAND *Sales Offices:* Chicago · Davenport · Detroit · Houston · Indianapolis
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"We turn out 20,000 toasters a week"

"Before we put in automatic presses, we had some real problems with fasteners in our assembly operation. With eight different types of rivets and screws, it was a real headache. Now, with slight changes in stamping, we've standardized the job and speeded up the line 30%. Got the idea from something they're trying in making washing machines."

Because all Metalworking plants work with similar materials, employ comparable equipment and share common problems, this sort of "technique borrowing" is a commonplace matter with Metalworking production management. Although Jim Kowalski is hypothetical, he's typical of the idea-hungry production engineers and executives in Metalworking.

American Machinist is created for these men. Serving *all* Metalworking plants and *all* production operations in these plants, it gives readers a production-minded coverage of new thinking in the whole field. And it's know-how in depth; is presented in a way that helps the production man in his operations—now. That's why so many of them say . . .

"I have to read American Machinist"

McGraw-Hill Magazine of Metalworking Production
330 West 42nd Street, New York 36, New York

Field Report . . .

Budd Lewyt Electronics Inc. The Cleveland Welding Division manufactures wheel rims for trucks and tractors.

Illinois Tool Works Consolidates

Pacsol and Calinoy, the two West Coast divisions of Illinois Tool Works, Chicago, have moved into a new plant in Hawthorne, Calif. Pacsol develops and produces rotary solenoids and switching devices; Calinoy makes special purpose metal and plastic fastening devices for the aviation and missile industries.

Boothe Leasing Expands

Boothe Leasing Corp, one of the nation's largest lessors of industrial equipment and machinery, has taken over Federal Leasing Corp of Los Angeles. Acquisition will make Boothe, with total assets of $23 million, the largest company of its kind in the US. Federal's name, personnel, and method of operation will be maintained and integrated into the Boothe system.

Three ICBM Launching Pads Scheduled for Northern Calif

Air Force has given the signal to the Sacramento (Calif) District Corps of Engineers to go ahead with land acquisition and construction of three underground Titan intercontinental ballistic missile launching pads near Beale Air Force Base. Cost is estimated at $42 million total. It's estimated that 50 acres of land will be needed for each unit and AF has asked for completion of the facilities within 22 months. About 700 SAC personnel needed to man the ICBM units will be stationed at Beale and will commute to the launching sites located near Chico, Sutter Buttes, and Lincoln. Beale is the fifth AF

"Oh stop it! I do the work of three people too . . . and without automation!"

One hand moves it EASILY!

THE WELLS MODEL 49A

"2 IN 1" METAL CUTTING BAND SAW WITH **WHEELS** AND **HANDLE**

(Optional Equipment)

We've taken our popular Model 49A . . . put it on heavy duty, rubber tired, ball bearing wheels . . . added a smooth one piece fold-down handle. Here's a metal cutting band saw that's REALLY MOBILE . . . that can be wheeled wherever needed . . . quickly . . . easily.

The Wells Model 49A is a dual purpose saw. As a horizontal cut-off machine, it has a capacity of 3½" x 6". Swing the head into vertical position . . . it becomes an upright band saw for cutting angles, slots, notches, bevels and contour work.

The wheel and handle unit is optional equipment, available both for new machines and those already in service. The modest cost will be repaid many times over in time and labor savings. Your local Wells Distributor can give you the details . . . or if you prefer, write for Bulletin 253-H.

Wells Saws

Wells®

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION

505 Roosevelt Road, Three Rivers, Mich.

OSBORN

BEFORE BRUSHING
Corners of intricate multiple contours were hand-filed to remove burrs. Results were inconsistent. Former production rate: **24** *per hour.*

AFTER BRUSHING
All surface junctures are blended accurately to predetermined specifications. Results are uniform...quality is high. Osborn 3-A Machine production rate: **63** *per hour.*

Production up 62% on this finishing job

...with OSBORN power brushing

PUSH-BUTTON FINISHING OPERATION ... *with Osborn 3-A Machine using Osborn Economy Wire Brushes. Operator simply loads part...starts pre-set brushing cycle... and unloads part after brushing.*

Formerly, this air conditioner manufacturer finished 24 compressor bodies per hour. He now finishes 63 per hour . . . *a 62% increase in production.* But that's just the start.

Quality now is uniform because Osborn power brushing thoroughly removes all burrs that might ultimately damage the compressor. Each surface juncture of the intricate contour is also formed to an exacting, predetermined blend . . . all automatically.

Your Osborn Brushing Analyst will gladly provide complete details. He will show how you can benefit on similar operations in your own plant.

Write now for full details on Osborn Metal Finishing Machines. *The Osborn Manufacturing Company, Department C-91, Cleveland 14, Ohio.*

Osborn Brushes

METAL FINISHING MACHINES...AND FINISHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

base selected to support the Titan, expected to have an eventual range of 9000 miles. Others are Lowry in Colorado, Ellsworth in South Dakota, Mountain Home in Idaho, and Larson in Washington.

MEMOS

by BESS RITTER

Many words in the every-day vocabulary of the average machinist are also a part of the every-day vocabulary of the average criminal: "Nail," for example, is a verb and not a noun, and means to arrest with absolute proof of guilt. A "boiler" is an automobile.

"Brass" is a synonym for a prison official of high rank, such as a warden. A "screw" is a guard. An "engine" is an opium pipe. "To drill" has two meanings. The more popular (which is frequently heard on TV thrillers) means to either wound or kill with firearms. In southern states, however, some criminals also use "to drill" to indicate a prison term.

"Grease" has four meanings, and although they're all different, none has anything to do with machinery. Instead, the word may be used to refer to (a) a bribe, especially as protection from a criminal charge; (b) money which a sucker is allowed to win while gambling, in order to stimulate him to play for higher stakes; (c) the act of being arrested (as "in the grease"); and (d) a solution of dynamite and picric which is used for blowing up a safe.

The most surprising word of all, however, is the term "mechanic," which means, to the underworld, either a man who specializes in opening safes without using explosives or oxyacetylene, or a person who is expert at swindling with cards.

Electronic parts courtesy Judson Mfg. Co., Inc., Cornwells Heights, Pa.

Mirror-bright without polishing, after switch to Sunicut

Boring on a multiple-spindle automatic produced the finish you see on these electronic parts. Sunicut 102-S Cutting Oil saved time and money by eliminating the polishing operation. The same automatic uses Sunicut 102-S to machine metals ranging from titanium to stainless 410.

Sunicut 102-S is one of a full line of cutting oils known throughout metalworking for maintaining long tool life, close tolerances, and fine finishes. There's a grade of Sunicut that can help you improve your product quality—and *that's* the best economy of all.

To choose the right Sunicut, ask the Sun man; that's part of his service to you. Or write to SUN OIL COMPANY, Dept. AM-11, *Philadelphia 3, Pa. In Canada: Sun Oil Company Limited, Toronto and Montreal.*

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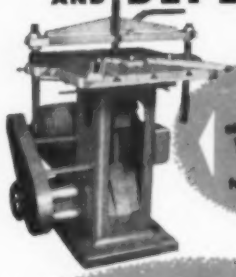
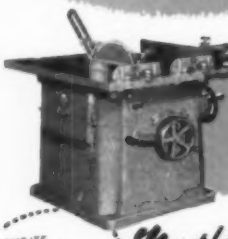


Northfield KEYSEATERS
This keyseater is designed to cut straight or tapered keyways from 1/8" to 1" wide. Work of any shape and diameter can be clamped to the table and cut, grooved, or slotted.

Northfield BAND SAWS
Speed, precision, dependability, value, all are painstakingly built into the Northfield 36" Band Saw. Speeds can be altered for different metals, plastics, fabrics, woods, etc.



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MACHINES AND ATTACHMENTS

1 HYDRAULIC PRESS BRAKES—*Verson Allsteel Press Co, 9300 S Kenwood Ave, Chicago 19, Ill.* 16-page catalog HPB-59 contains data with specifications on models ranging from 150 to 1800-ton capacity. Describes design details; includes photos of typical units.

2 HORIZONTAL BORING MILLS—*Cincinnati Gilbert Machine Tool Co, 3366 Beekman St, Cincinnati 23, Ohio.* Illustrated 2-page bulletin 759 describes automatic positioning systems for company's horizontal boring, drilling, and milling machines. Completely independent of the feed mechanism, the Gilbert system utilizes either program bars, blocks, or end measures. Users can lay out holes directly from prints.

3 VERTICAL INJECTION MOLDING MACHINES—*Progressive Tool & Die Co, 530 Boston Turnpike, Shrewsbury, Mass.* 4-page bulletin, Form 959, illustrates and describes two models with 1 or 2-oz capacity per shot, injection pressure 9428 or 24,000 psi, injection stroke 5½ or 8 in. Units, for insert, contact, or plug molding, have sliding table that permits max freedom in positioning inserts.

4 BENDING MACHINES—*Pines Engineering Co, 601 Walnut, Aurora, Ill.* 4-page illustrated bulletin contains information on units for tubing, pipe, extrusions, and rolled sections. Models and typical applications pictured, specifications tabulated.

5 MANUAL PRESS CONTROLS—*Micro Switch, Freeport, Ill.* 16-page catalog 65b explains how Micro Switch Trip Control can be easily applied to manually operated stamping machines, air presses, riveters, press brakes, shears, welders, paper cutters and similar units to increase safety and production. Detailed descriptions and photos of 15 different installations included.

6 STOCK STRAIGHTENER—*Dickerman Mfg Co, 321 Albany St, Springfield, Mass.* 4-page bulletin, Form 12, gives data on essential features of variable speed, medium duty units with 2 pinch rolls and all lower rolls powered, available with 5 or 7 straightening rolls.

7 RIVET SETTERS—*Chicago Rivet & Machine Co, 950 S 25th Ave, Bellwood, Ill.* 4-page illustrated bulletin describes complete line of single and multiple units that are air-powered and air-cushioned in operation. Latter permits use

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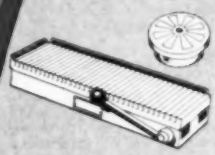

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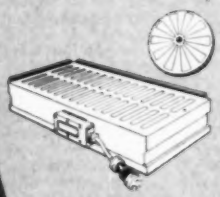

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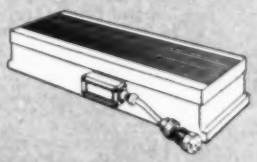

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AVAILABLE WITH FROM ONE TO SIX OR MORE GRINDING HEADS

CAPACITIES:

6" x 96" Belt:
5½" max. width and
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9" x 96" Belt:
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OPTIONAL FEATURES:

Electro-Magnetic chucks
Powered elevation of grinding heads
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From the leaders in the industry . . .

The new Series 96 Heavy Duty abrasive belt machines are built to deliver toolroom precision in continuous production runs.

High speed multiple grinding and finishing operations are performed in the same time required for a single operation. Rapid, exceptionally heavy stock removal permits unmachined surfaces to be ground to fine finishes and exacting tolerances in one continuous pass.

Heavier construction and solid, one-piece work table enable Series 96 machines to maintain tolerance standards of ± .0005 on flat finishing, with stock removal up to 1/32" per head on ferrous material.

Conveyorized feed is adjustable, ranging from 0' to 67' per minute. Both conveyor and abrasive belts feature pneumatic tensioning.

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***Precision* Abrasive Belt Grinders**

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of semi-tubular rivets for fastening fragile materials in conjunction with metals, minimizing breakage and rejects.

TOOLS AND ACCESSORIES

8 VISES, CHUCKS, DIVIDING HEADS—*L-W Chuck Co, 25 S St Clair St, Toledo 4, Ohio.* 8-page catalog illustrates and describes full line of milling machine and drillpress vises, dividing heads and attachments, and lathe and magnetic chucks, demagnetizers, and rectifiers. Specifications provided.

9 FLEXIBLE SHAFT EQUIPMENT—*Wyzenbeek & Staff Inc, 223 N California Ave, Chicago 12, Ill.* 8-page catalog 59 covers Wyco line including new varispeed and transformer type variable speed flexible shaft grinders. Wyco tools also described.

10 STRAIGHTENER AND BENDER—*Architectural Iron Inc, 904 22nd St, Rockford, Ill.* Illustrated bulletin presents information on lightweight Strait-O-Flex for straightening or curving a wide variety of parts and fabricated sections. Application photos and specifications included.

11 DIE CUSHIONS—*Verson Allsteel Press Co, 9300 S Kenwood Ave, Chicago 19, Ill.* 16-page catalog DC-59 describes line including pneumatic, hydro-pneumatic, and hydraulic types. Size and capacity data given as well as information on typical die cushion arrangements. Applications illustrated.

12 TEMPERATURE CONTROLS—*Fenwal Inc, Pleasant St, Ashland, Mass.* 8-page folder illustrates and describes how controls are used in gas exhaustion chambers, tempering tanks, pipelines, test ovens, plating tanks, electrostatic sprayers, air temperature and radiant heat applications. Includes brief descriptions of Fenwal controls suitable for these.

13 SPRAY GUNS FOR DIE LUBRICATION—*DeVilbiss Co, Toledo 1, Ohio.* Condensed catalog sheet gives information on specially designed automatic gun for applying lubricating oils or drawing compounds to dies or all types of coolants to abrasive wheels and to belts. Spray pattern is adjustable from a fine, round shape to a broad fan. Other automatic spray guns for use in similar applications, but varying in size, are listed with full specifications and accessories.

14 OILERS—*Lunkenheimer Co, Box 360, Cincinnati 14, Ohio.* 4-page illustrated circular 580 describes bottle oilers, oil cups, and constant level oil controls. Application data and dimensional specifications cover automatic constant oil level controls, bottle oilers for plain bearing lubrication, glass body oil cups, and aluminum body oil cups for severe industrial service.

15 BOLT TENSION CALIBRATOR—*Skidmore-Wilhelm Manufacturing Co, 442 S Green Rd, Cleveland 21, Ohio.* Article available describes how Buick found it could reduce threaded fastener inventory and still do a better job by duplicating actual production line conditions in the lab to test torque-tension relationships for different bolt, nut and washer combinations. Skidmore-Wilhelm calibrator is basic tool around which Buick's testing equipment was built.

PLANT SERVICE EQUIPMENT

16 BARREL FINISHING—*Carborundum Co, Niagara Falls, NY.* 36-page booklet, "CARBOtrol 7," sets up a 7-point system for scientifically controlled barrel

finishing. Covers size and type of media; ratio of media to parts; load height; water; compounds; barrel speed; and tumbling time. Complete line of tumbling media, barrel finishing compounds, and precision barrel finishing machines and equipment is listed for full range of operations.

17 MICRO-POLISH UNITS—*Murray-Way Corp, PO Box 180, Birmingham, Mich.* 8-page illustrated brochure, Form 59-1, contains description of units for grinding and polishing coils, blanks, and sheets in all materials. Discusses features and advantages; gives detailed engineering specifications. Auxiliary equipment described.

18 PUMPS—*Aurora Pump Division, NY Air Brake Co, Loucks St, Aurora, Ill.* 8-page bulletin S111 illustrates and describes features incorporated in new design of Apco turbine type units with capacity range up to 150 gpm, pressures to 300 psi, temperatures to 275 F. Includes exploded views, selection tables, limitation charts, dimensions, construction specifications.

19 VIBRATOR—*Lord Chemical Corp, 2068 S Queen St, York, Penna.* 4-page bulletin 1016E contains illustrated details on Lorco Model 1016E, a 3-hp unit for precision finishing of metal, plastic, or wooden parts. Model has a bowl capacity of 1.1 cu ft. Construction features and detailed specifications given, plus standard equipment.

20 AIR HOISTS—*Detroit Hoist & Machine Co, 8201 Morrow St, Detroit 11, Mich.* 4-page bulletin 862 covers Types PR and PRV; former utilizes a reversible 5-cylinder air motor for smooth operation and can be furnished in either throttle type or rope control; latter is equipped with sliding vane, rotary air motor, and is furnished in throttle type control only. Sizes, capacities, dimensions, specifications tabulated in detail.

21 MODULAR ELECTRICAL CONTROL CENTERS—*Clark Controller Co, 1146 E 152nd St, Cleveland 10, Ohio.* 16-page bulletin PL6200 illustrates advantages and adaptability of ac motor control centers and includes plan-it-yourself forms and instructions. Units are available in several types of construction and can be furnished with special control panels, lighting panels, operator's panels, and in a range of enclosures. They house a variety of combinations of circuit breakers, combination starters, magnetic starters, control relays, etc, to provide an individualized, flexible, compact installation.

22 STEEL WORK BENCH—*Angle Steel Inc, Plainwell, Mich.* 12-page illustrated bulletin 5950 presents illustrated construction details on new design of ASI unit. Bench length is 4, 5, and 6 ft; depth

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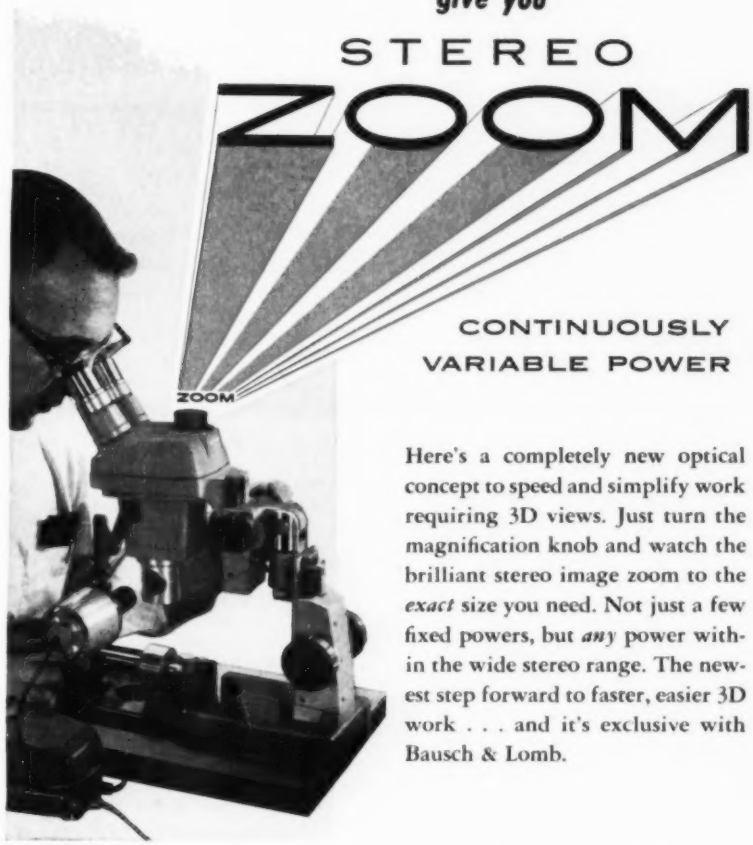

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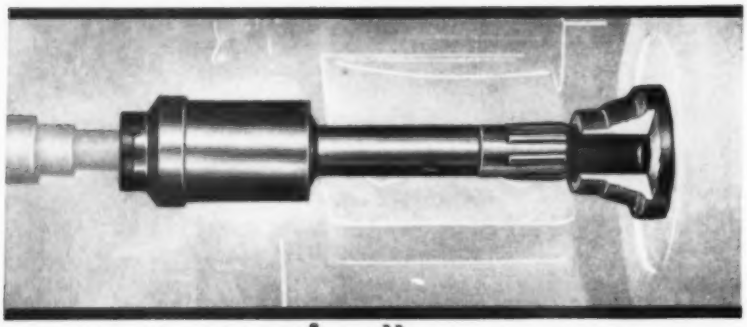

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- Sizes in increments of .000025" or less. Performs sizing jobs never before possible, ideal for bearing seats, oilite bushings, parts out of tolerance, etc.
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- Microller burnished surface is a new concept . . . surface is *rolled* out, metal is condensed and hardened for longer wear. No grinding or honing grooves to wear away in service.

More than a thousand companies . . . including the top twenty in metalworking . . . have replaced costly finishing and sizing methods with Microller burnishing. Reports of 90% savings in production costs are common!

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is 24, 30, and 34 in.; height is 32, 34, and 36 in. Top surfaces can be heavy-gage steel, Masonite on steel, laminated hardwood for electrical or tool work, Masonite on wood core for utility service. Five drawer combinations are offered.

23 PAINT STRIPPERS—*Enthone Inc, Box 1900, New Haven 8, Conn.* 4-page brochure, Form 23141, describes complete line that will strip all types of air dry and baked synthetic enamels as well as printed circuit resists. Various types such as fast-evaporating, cold chlorinated, organic emulsion, hot alkaline, and newly developed water-dilutable cold strippers are discussed. Methods of removing epoxies, vinyls, alkyds, phenolics, and other synthetics are explained.

24 VACUUM EQUIPMENT—*Invincible Vacuum Cleaner Mfg Co, Dover, Ohio.* 4-page folder describes use of equipment in reclaiming, processing, and conveying a variety of materials. Discusses typical applications such as pneumatic conveying of plastic pellets, cleaning boiler tubes, removing used coolant from machine sumps. Covers range of standard models and illustrates special units for use in hazardous applications.

25 INDUSTRIAL TRUCKS—*Baker Industrial Trucks, 8000 Baker Ave, NW, Cleveland 2, Ohio.* 6-page bulletin 59 describes and illustrates rider-type electric and gasoline powered fork trucks; the side-loading Traveloader, either gas, electric, LP, or diesel operated; electric platform trucks; and electric crane trucks.

26 SAFETY GLASSES—*American Optical Co, Safety Products Div, Southbridge, Mass.* 12-page illustrated catalog S-8582 covers entire Ultrascopic line. Glasses with clear lenses, with and without side shields, and with Calobar lenses, available in a variety of frames, are covered.

PARTS AND MATERIALS

27 WORM GEAR SPEED REDUCERS —*De Laval Steam Turbine Co, Trenton, NJ.* 32-page illustrated catalog 3805 covers line of Delroyd single reduction reducers which utilize worm and gear materials permitting the max ratings allowed by the new AGMA standard. They also incorporate an involute helicoid thread form with the highest load capacity of any type of worm gear. Four types are covered: Type D, for 2½ to 4-in. centers, which adapts to any mounting position; and types for bottom drive, top drive, and

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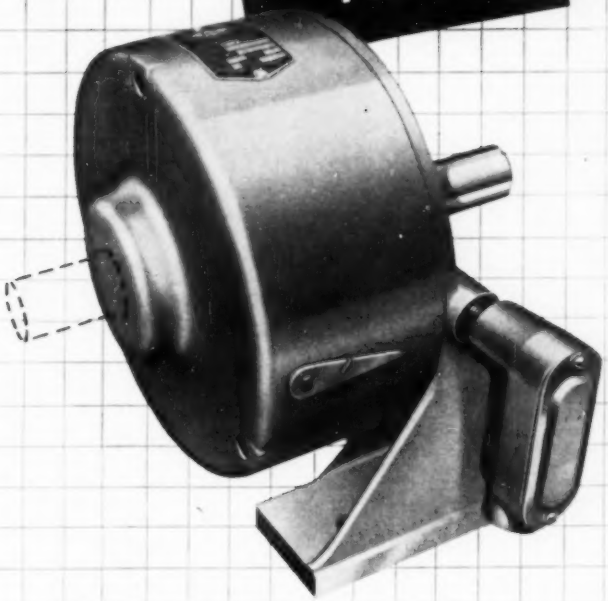

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First and Only Disc-Type Brake to fulfill J. I. C. Specifications The efficient, direct-action operating advantages of the Reuland disc type magnetic brake are now available for the first time in this self-contained unit. Being foot-mounted, it can easily be coupled to existing motor or equipment shafts in accordance with J.I.C. specifications. As a standard unit it also can be purchased "off the shelf" by O.E.M.'s or added to equipment at any time by users. Available with either single or double end shaft.

Also available without shaft Reuland disc type magnetic brakes are also supplied for applications where the motor or equipment shaft can be extended directly into the brake. These units are available in both foot-mounted and endbell mounting types. Together with the completely self-contained unit described above, these brakes provide low cost, compact size and efficient operating features that are unequaled.

Reuland Brakes provide great versatility
Shaft can be extended entirely through brake, when desired. Also, hook-ups with Reuland Fluid-Shaft motors and Motoreducers permit many J.I.C. and other unique power and braking combinations... combinations that can be tailored to your exact drive requirements without huge, special development costs.

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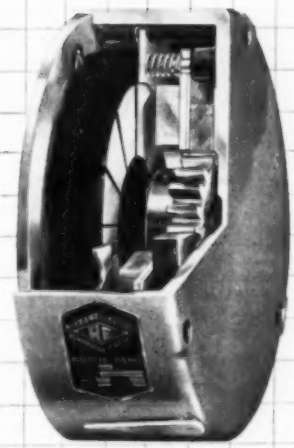

Cutaway view of endbell mounting type

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Contains engineering information on Reuland's complete line of standard motors and motoreducers. Sent free on request.

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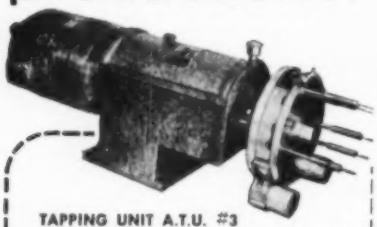

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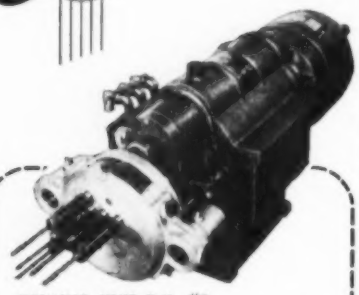
Completely self-contained all-electric lead screw precision unit. Quickly interchangeable for fast single or multiple spindle head operation. With forward and reverse electro-magnetic clutches and variable torque control.

Ettco-Emrick **TAP & DRILL TWINS**



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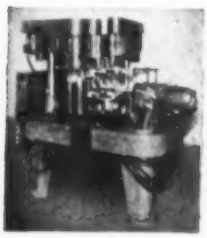
Completely self-contained precision unit with powerful air feed and hydraulic control. Quickly interchangeable for fast single or multiple spindle head operation.

Used singly or in combination they offer the flexibility and adaptability to meet modern drilling and tapping requirements. When combined with Ettco-Emrick multiple spindle heads they'll set new standards of precision, speed and economy.



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vertical mounting—all available in sizes for 5 through 12-in. centers. Engineering data and specifications included.

28 SPECIALTY STEELS—*Carpenter Steel Co, Reading, Penna.* 40-page catalog covers tool and die steels; stainless; high-temp alloys; electronic, magnetic, and electrical alloys; special-purpose alloy steels; tubing and pipe; and fine wire specialties. Includes a tool steel selection and identification chart; tables of properties, corrosion resistance, and workability of stainless and high-temp alloys; and type analysis of Webb stainless steel wire.

29 PILLOW BLOCK BEARINGS—*Triangle Manufacturing Co, 700 Division St, Oshkosh, Wis.* 40-page catalog 50-59 illustrates and describes line of sleeve-type, self-aligning pillow blocks; single-bolt mountings; wall bearings; pedestal bearings, tri-arm bracket assemblies; plain and cushioned flange mountings. Includes data on applications, variations, lubrication, and installation.

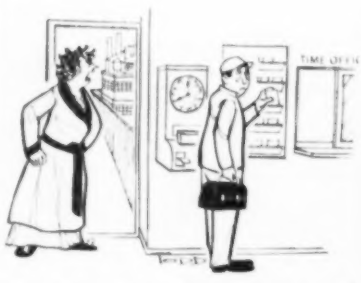
30 SPEED REDUCERS—*Ohio Gear Co, 1333 East 179th St, Cleveland 10, Ohio.* 65-page pocket-size catalog covers new Hi-Line Series of fin and fan cooled units. Contains engineering data, dimensions, and application selection charts.

31 EPOXY—*H B Fuller Co, 255 Eagle St, Saint Paul 2, Minn.* 30-page catalog presents information on Resiweld line of adhesives, plastic alloys, sealants, coatings, together with their current applications. Characteristics, directions for use, engineering data in tabular form included.

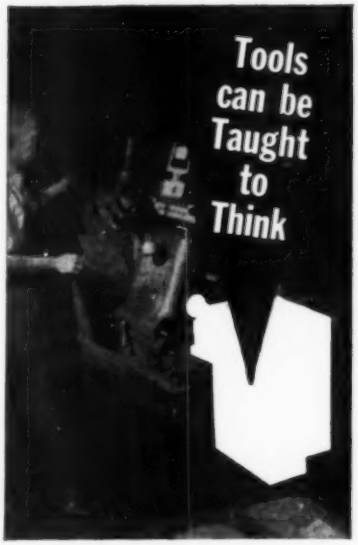
32 VARIABLE SPEED TRANSMISSION—*Western Manufacturing Co, 5400 Scotten Ave, Detroit 10, Mich.* Literature illustrates and describes Model 19000 with ratios 3:1 to 9:1 and basically constant horsepower. Unit requires no internal lubrication and can be operated in any position. Contains engineering data and specifications.

33 SUPERALLOYS—*Kelsey-Hayes Co, Dept 15, Metals Division, New Hartford, NY.* Two technical bulletins cover performance data on vacuum induction melted Udimet 700 and Udimet 41 (also known as Rene 41) high-temp, high-stress superalloys presently being used in jet engines, missiles, electronic tubes, and process and nuclear industry applications. Information presented includes alloy description and chemical composition, physical constants, tables and charts on mechanical properties, isostress curves, and data on heat treatment and finishing.

34 VERTICAL HOLLOW SHAFT MOTORS—*Ideal Electric & Manufacturing Co, Mansfield 86, Ohio.* 4-page bulletin 212 gives information on units 15-125 hp,



"And at five-thirty I'll have a few more words to say on the subject . . ."



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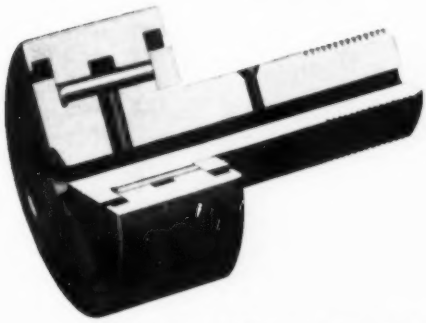

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Special seals are built in at stud and flange ends. A black oxide finish on all exposed surfaces offers outside corrosion resistance. The channeled reservoir above the rollers in the outer raceway bore helps store reserve lubricant, sufficient in most cases for lifetime service. Relubrication is possible through convenient oil holes. The new SCF sealed CAMROL cam followers interchange with proven standard CAMROL cam followers. Standard stock with roll diameters up to 4" are available for both stud and shaft mounting.

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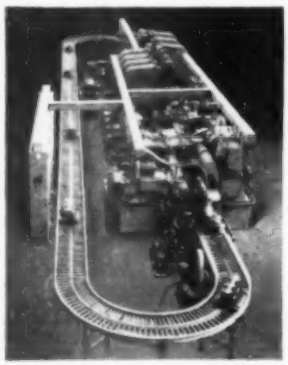
W-L CHICAGO Steady demand for "B" No. 3X for flame-hardened parts such as boring bars. Good stocks of HY-TEN AIS — the best carburizing alloy steel, and freest machining available today — a new W-L exclusive!

W-L CINCINNATI This 23-station Avey Line-O-Dex transfer machine, designed and built by The Avey Division of Motch & Merryweather Machinery Co., Cincinnati, Ohio, is equipped with spindles made of our HY-TEN "B" No. 2. This grade was chosen for its great tensile strength (100,000 P. S. I. in the natural condition), toughness, and fine wearing qualities.



W-L CAMBRIDGE We are now distributing FLEXANGLE, the easy-to-erect structure assembly for all types of racks, shelves, platforms, etc. It's completely universal and low in cost — can be used anywhere, by anyone, for any storage purpose.

W-L HILLSIDE Our stock of flat and square sizes in HY-TEN M Temper Oil Hardening Steel can save you time and money in your tooling program. HY-TEN "B" No. 3X pre-heat treated in rounds, squares and flats available in a wide range of sizes. Billets on hand for hammer forging in all grades of HY-TEN.

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W-L BUFFALO A wide range of rounds and hexagons in cold drawn AISI leaded and non-leaded A-4140. Also many sizes of the new "B" No. 3X-40 in rounds and hexagons.

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AGENTS: Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal & Toronto

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

frames 284-505. Cutaway illustration gives specific details on design, construction, bearing, lubrication and ventilation systems. Lists dimensions, specifications, and standard coupling dimensions by frame size.

35 HIGH-STRENGTH STEEL—*Allegheny Ludlum Steel Corp, Oliver Bldg, Pittsburgh 22, Penna.* 24-page technical booklet discusses Potomac A chromium-molybdenum-vanadium hot work steel known as Type H-11 and noted for its high strength up to 1000 F. Data on applications, design properties, typical analysis, heat treatment, fabrication, corrosion protection, consumable electrode vacuum melting, and product forms.

36 BEARINGS—*Kaydon Engineering Corp, McCracken St, Muskegon, Mich.* 4-page bulletin gives information on extremely thin section bearing line designated Reali-Slim CP that includes 90 sizes with from 4 to 12-in. bores. Sizes range from ¼ to 1-in. width and cross section. Covers prices, specifications, shaft and housing sizes, internal clearances, cross section drawings.

● MOTOR CONTROL DIGEST—*Allis-Chalmers Manufacturing Co, Milwaukee 1, Wis.* 162-page digest contains descriptive, pricing, technical, and engineering information on complete line. Quick reference selector guide facilitates locating of any starter, controller, or pilot device in the book. Request direct on company letterhead.

37 SILICONE RUBBER COMPOUNDS—*General Electric Co, Silicone Products Dept, Waterford, NY.* 12-page bulletin CDS-170A presents product and application data on RTV compounds for potting and encapsulating of electrical and electronic equipment, high and low-temp sealing, and for flexible mold-making materials. Includes suggestions for handling, curing and viscosity characteristics, and information on primers for bonding applications.

38 DIE ALLOY—*Ampco Metal Inc, 1745 S 38th St, Milwaukee 46, Wis.* 4-page bulletin G55 provides information on Di-Bronze for drawing, forming, or bending stainless and clean mild steel. Discusses advantages and applications, includes listing of available stock sizes.

39 SOCKET SCREW PRODUCTS—*Standard Pressed Steel Co, Box 875, Jenkintown, Penna.* 8-page bulletin, Form 2338 covers complete line of Unbrako fasteners that offer ultimate tensile strengths as high as 200,000 psi. Properties, applications, and features of both alloy and stainless socket screws included; configurations, sizes, materials, design features, proper installation are charted.

"Why is it I can never find the foreman when I want him, but the minute I goof off I have him on my neck!"

46% gain in production with BAKER®

ADJUSTABLE SPINDLE MACHINE

Standard Baker Vertical Adjustable Spindle Drilling Machine.

Cutting production time on an individual part from 6 minutes to 2 minutes, 47 seconds is typical of the production efficiency delivered by a new BAKER drilling machine at a leading manufacturer of power transmission equipment.

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This demonstration of BAKER speed and flexibility proves again that BAKER basic units are the foundation of today's most efficient drilling and tapping operations.

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STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES

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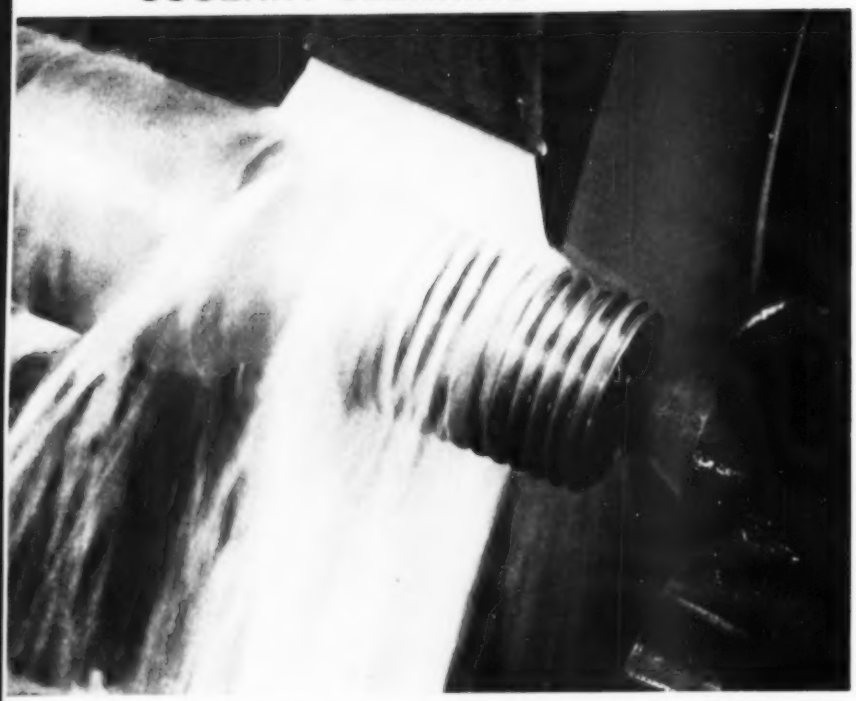
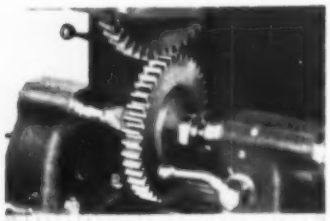
EXCESSIVE WHEEL DRESSINGS
with BARNESDRIL
COOLANT CLEANING



Low-Cost Method of Removing Chips — Grit Automatically, Extending Wheel Life Through Fewer Dressings, and Controlling Uniformity of Ground Finishes.

This grinding operation illustrates the important cost savings which can be realized on all grinding operations, through the use of Barnesdril Coolant Cleaning Equipment. These savings, and the production improvements gained through automatic removal of sludge from coolant, are the reasons why more than 35 original equipment manufacturers specify Barnesdril Coolant Cleaning units on their machines.



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Clean coolant is of utmost importance on gear shaving operations in controlling uniform finish on gear teeth. Automatic removal of chips from machine coolant saves the life of shaving cutters and preserves the accuracy of finished gears. Inquire about Barnesdril Cleaning Units for your gear shaving equipment.

Barnesdril Coolant Cleaning units are available in a range of sizes up to 350 gpm. – either Magnetic Separators or Combination Kleenall types – depending on degree of purity required.

Two complete catalogs describe the production savings of these automatic units applied to a variety of finish machining operations.

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Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

40 ALL-PURPOSE PANEL METERS —*Assembly Products Inc, 75 Wilson Mills Rd, Chesterland, Ohio.* 12-page bulletin 107 describes indicating panel meters and pyrometers in numerous sensitivities, styles, and sizes, for monitoring any electrically measurable variable. Lists general specifications, then groups them according to case types. Prices, mounting dimensions, ordering information, accessories included.

41 SWITCHING VALVES—*Moog Servocontrols Inc, East Aurora, NY.* Bulletin 106 describes operating principles, performance characteristics, and typical applications of Series 19 acceleration switching servovalves for hydraulic control systems. They permit operation with fluid temperatures up to 600 F, low resolution and hysteresis, high velocity gain.

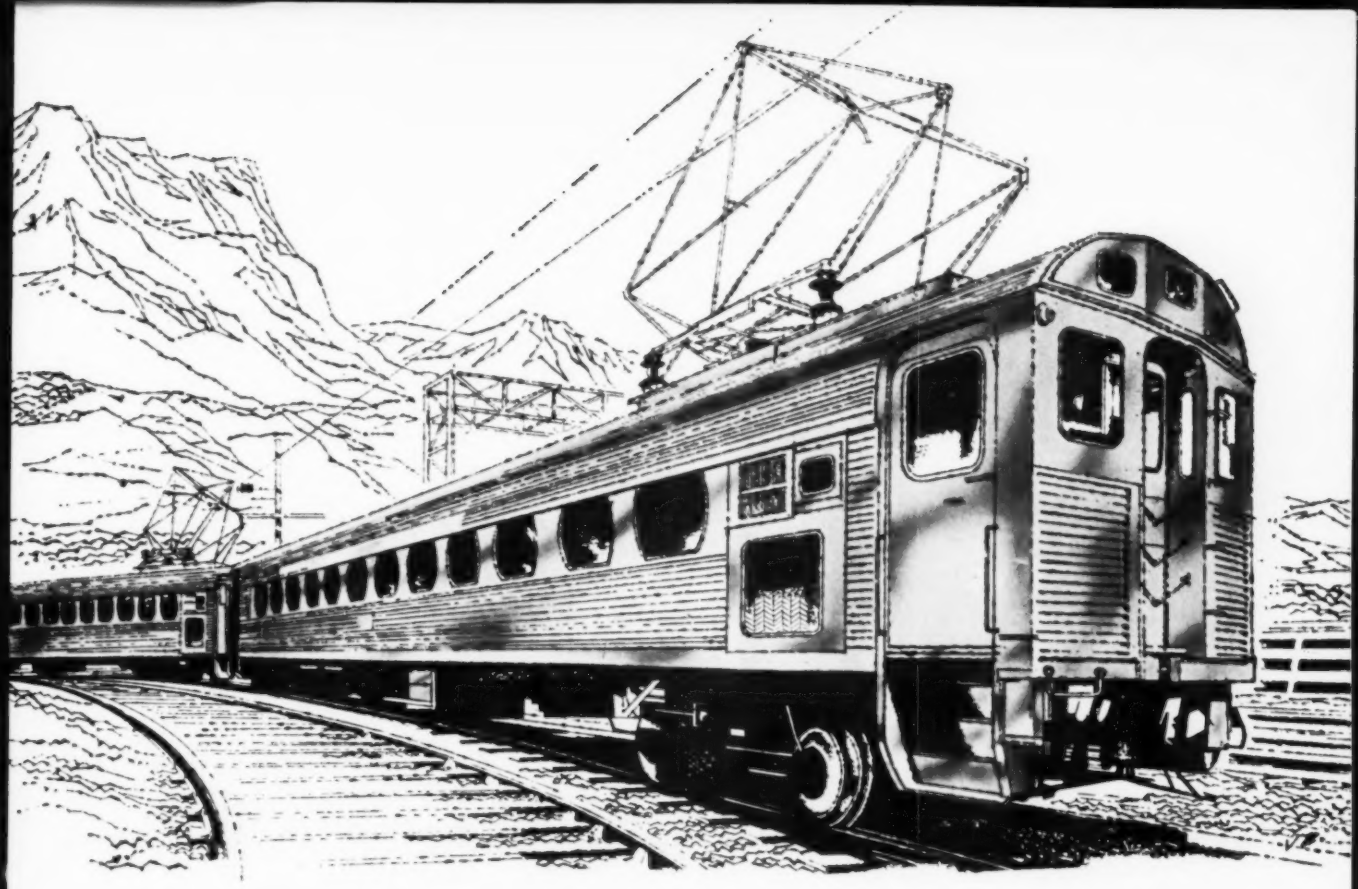
MISCELLANEOUS

42 DRAFTING MACHINE — *Glideline Corp, 200 S Potomac St, Waynesboro, Penna.* 4-page illustrated bulletin M70 describes improved Model 70 designed with minimum of moving parts. Method of mounting offers instant interchangeability with other units of the same size or for use on other boards. Detailed specifications of all components included.

43 "BETTER CHEMICAL MILLING THROUGH RESEARCH"—*Chemical Milling International Corp, 1350 E Franklin Ave, El Segundo, Calif.* 4-page brochure describes company's services which include research, consultation, and production of chemically milled parts.

44 FORMING, STAMPING, AND ASSEMBLY FACILITIES — *Hunter Spring Co, Division of American Machine & Metals, Inc, 1 Spring Ave, Lanadale, Penna.* Data sheet 601b describes facilities for wire and strip metal forming, stampings, and assemblies. Illustrated with photos of typical parts, literature lists maximum dimensions of work that can be formed.

"Just a second—hold on—I'm checking my files for it—"



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Because it makes practical use of the remarkable strength-weight ratio of the austenitic stainless steels, this all-stainless steel railroad passenger car weighs **25 tons less than other so-called modern equipment.**

It is an important contribution to railroad operating economy and efficiency because its stainless steel structure guarantees millions of miles of service between overhauls —its gleaming exterior requires no paint.

Designed and built by The Budd Company, it is considered one of the greatest engineering achievements of the century—made possible **only** by that brawny beauty stainless steel.

In your product engineering when weight is a problem and strength a necessity the answer can be found in stainless steel's unique combination of strength, durability and beauty.

J&L leads the industry in melt shop standards for stainless steel—the point where quality starts, **and engineering achievement begins.**

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New, high-tensile steels require
special care when welding.

Submerged arc welding gives the most reliable
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but . . .
most conventional, submerged arc equipment is
impractical for one-of-a-kind jobs . . . like a
28 cubic yard bucket.

That's why Peabody Coal Company used a
"Mechanized Squirt Welder".
The "Mechanized Squirt" gives the user
all the control and high quality
of completely automatic submerged arc welding
without the need of expensive fixtures.

Mechanized "Squirt" simplifies T-1 steel fabrication...

RESULT: Peabody Coal welded the **T-1,**
firebox-grade steel
at speeds up to four-times faster than manually,
with the "Mechanized Squirt Welder"
and got perfect welds with L-61 electrode
and Lincoln alloy flux.

For complete details on the "Mechanized
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ac motors and battery chargers

Landis Machine Co, Waynesboro, Penna, has elected **Leslie M Hess** (left) vice president and assistant general manager. Formerly treasurer and assistant controller, he has been a member of the board of directors since 1956. **E C Hanna** (center), chief research engineer, has been elected to the newly created post of director of engineering. **George W Lyman** succeeds Mr Hanna. Prior to joining Landis last year he was chief engineer for Reed Rolled Thread Die Co

NAMES IN THE NEWS...

United-Greenfield Corp has elected **Woodrow Tichy** a vice president. He will continue as general manager of the **Whitman & Barnes Division,** manufacturer of drills, reamers, and carbide tools, at Plymouth, Mich.

Rotex Punch Co, San Leandro, Calif, manufacturer of punch presses, has named **Frank Colbourn** general manager. He was formerly vice president of S F Stores Division of Moore Machinery Co.

Leece-Neville Co, Cleveland, has named **George B Howell** vice president, manufacturing, for all divisions. He was formerly associated with General Electric Co as manager of the Fort Wayne Heretic Motor operations.

Timken Roller Bearing Co, Canton, Ohio, has named **Ross Russell** manager of industrial engineering. He has been division industrial engineer of the Steel and Tube Division since 1955.

Ferry Cap & Set Screw Co, Cleveland, has elected **Harold D North Jr** president of the company. Mr North, formerly executive vice president of Engine Parts Manufacturing Co, Cleveland, succeeds **C B Lansing Jr** who resigned in June.

Elwell-Parker Electric Co, Cleveland manufacturer of powered electric industrial trucks, has named **Robert G Vance** to the post of chief development engineer. He was formerly design engineer and chief draftsman.

Henry P Boggis & Co, Cleveland manufacturer of grinders and grinding heads, has named **Donald M Pattison** president of the firm. He was formerly vice president of Motch & Merryweather Co, Cleveland

Heald Machine Co, Worcester, Mass, has appointed **George H Lockwood** manager of development and research. He has been serving as supervisor of grinding engineering and has also been in charge of special projects

Besly-Welles Corp, South Beloit, Ill, has appointed **Keith A Hill** chief engineer of new product development. Associated with the organization since 1949, Mr Hill has worked in machine and tool design and has done development work on cutting tools and disk grinders.

Parker-Hannifin Corp, Cleveland, has named **O J Maha** president and general manager of its **Hannifin Co Division.** Mr Maha, formerly a Hannifin vice president, succeeds **Ellwood G Peterson** who will continue as a vice president and director of Parker-Hannifin.

US Industries Inc has appointed **S S Podnos** general manager of **USI Robodyne,** Silver Spring, Md, Division which develops and manufactures equipment for industrial automation. Mr Podnos played a major role in establishing the division.

Rockwell Manufacturing Co has appointed **W Thomas Gettig** vice president and general manager of the **LFM Manufacturing Co,** Atchinson, Kans, subsidiary which produces valves, castings, and parts. Mr Gettig was previously assistant to the vice president of Rockwell's Meter and Valve Division.

Torrington Manufacturing Co, Torrington, Conn, producer of wire-forming equipment, flat wire mills, and vertical four-slide machines, has appointed **Edward E Franks Jr** district sales manager in Chicago for its Machine Division. He has been chief engineer of the division for the past ten years.

ELDORADO® GUN DRILLS

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Precision drilling holes at a minimum cost, without loss of accuracy in hole alignment and surface finish, requires gun drills of absolute uniformity.

ELDORADO'S 'job-proven' gun drills have this designed-in quality to pay off in continuous low-cost hole drilling. Designed to gun drill holes to close tolerances ... to micro-finish, in *one single operation;* economically solving 'hole' problems in most materials.

Highest precision manufacturing on exclusively developed equipment and complete research facilities, assure you dependence on uniformity, quality and reliability.

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OA Lengths	4" to 120" with dia. limits	10", 16", 22", 36"	16", 22", 36"
Drivers	Std. or to fit your need	.750" dia. x 2 3/4" long	1" dia. x 2 3/4" long
Tips	Carbide	Carbide	Carbide
Now, order from stock, or send in your specifications for a prompt quotation.			

Specializing 100% in Gun Drills and Related Tools.

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ELDORADO TOOL & mfg. corp.

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NAMES IN THE NEWS . . .

Norton Co, Worcester, Mass, has appointed **Robert Cushman** (top) general sales manager of its Abrasive Division. **W Alex McCune** (center), manager of field sales, grinding wheels, succeeds Mr Cushman as sales manager of grinding wheels. **Harlan T Pierpont** has been named sales manager of abrasives. He was previously manager of sales for the Electro-Chemical Division

Cushman Chuck Co, Hartford, Conn, has honored **Harry E Sloan**, its chairman of the board, for his 60 years of continuous and active service with the company. Mr Sloan joined the concern as a workman in the factory

at the age of 19. He was elected first vice president in 1919, president in 1928, and has been serving as board chairman since 1952.

Fairbanks, Morse & Co, Chicago, has appointed **Walther C Fischer** director of engineering. He moves up from the post of manager of engineering of the company's Beloit Works, Beloit, Wis. At Beloit, **Paul Flood** has been named general manager of the Large Machinery Division, **H E Hanson** general manager of the Diesel, Compressor, and Locomotive Division, and **Clay Armstrong** general manager of the Magneto and Engine Accessory Division.

Cogsdill Tool Products Inc, Oak Park, Mich, maker of specialized hole finishing tools, has named **Donald T Walker** sales manager. Prior to joining the firm he was manager of industrial engineering for Chrysler Corp's Nine Mile Press Plant.

Westinghouse Electric Corp has appointed **H W Rainey Jr** general sales manager of its **Sturtevant Division,** Hyde Park, Mass, producer of air-handling products. He was formerly field sales manager.

Nice Ball Bearing Co, Philadelphia, has appointed **Thomas E Spence** vice president, engineering, and **F Russell Smith** chief engineer.

PIC Design Corp, East Rockaway, NY, subsidiary of **Benrus Watch Co,** and a manufacturer of stock precision instrument gears and servo components, has appointed **Rowland F Schwenker** vice president and general superintendent. Mr Schwenker is one of the founders of the corporation.

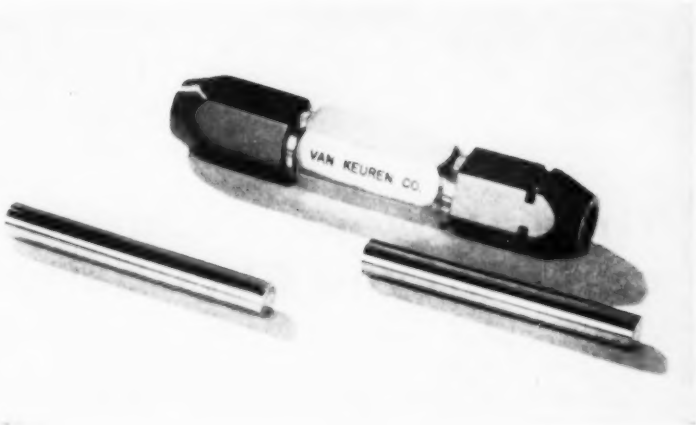
Frederic B Stevens Inc, Detroit manufacturer of electroplating equipment and polishing and buffing compositions, has named **Clyde H Reeme** president of the company to succeed **W Joseph Cluff** who has retired. Mr Reeme is president of the Udylite Corp, of which Stevens is a subsidiary.

Saco-Lowell Shops, Boston, has promoted **Anthony L Barclae** from sales engineer to sales manager of the Automotive Division.

Allis-Chalmers Manufacturing Co, Milwaukee, has named **James A Scoggin** to the newly created post of general service manager, Construc-

IMMEDIATE DELIVERY

Van Keuren WIRE TYPE PLUG GAGES



WIRE TYPE (REVERSIBLE) PLUG GAGES were originated by **THE VAN KEUREN CO.** in 1923, and since that time have been supplied to an ever expanding group of manufacturing concerns throughout the country and abroad. The wire type design has enjoyed tremendous popularity because of the inherent economy represented by the fact that the gage units can be reversed, or cut off, to obtain substantial increase in gage life.

As a result of our long experience in developing and pioneering the manufacture of wire type plug gages and the sale of millions of these units, we have come to know what sizes will be required during a given period of time, and have prepared ourselves by finishing in advance a multitude of units which are in constant readiness for shipment. Our methods of size prediction through research and sales analysis have been successful to the point that there is now better than a four out of five chance that at any time we will have on hand the gage or gages that you need. In addition improved and highly efficient methods of manufacture developed during the years of our work in this field make possible the manufacture, to your requirement, of any size not on hand, in an incredibly short time.

VAN KEUREN WIRE TYPE PLUG GAGES are made to the most exacting requirements as to diameter, roundness, hardness, stability and surface finish. They are offered in all tolerances from XXX (.00001") to ZZ, and are available as units, in handles, or in sets.

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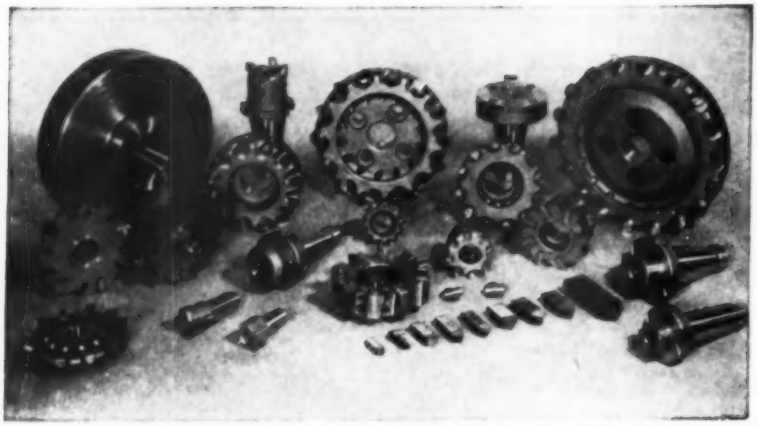
Since 1920
173 Waltham Street, Watertown 72, Mass.
PRECISION MEASURING TOOLS
. . . rated the world's most accurate
Plug Gages · Measuring Wires · Optical Flats and Light Wave Equipment · Gage Blocks · Precision Lapping Service and Parts



Milling Cutters — End Mills — Blades — Boring Tools — Arbors — Flywheels

These Lovejoy Products can help you Cut Costs!

The entire line of Lovejoy Milling Cutters and Accessories is designed to aid you in getting better production at less cost.

If you are not now using Lovejoy products, we invite you to do so at first opportunity.

Lovejoy precision-engineered tools include:

Inserted-tooth milling cutters (face, side, end, slotting and boring) which feature husky, forged steel housings; exclusive Lovejoy "positive-locking" blade assembly; a variety of dozens of models and hundreds of sizes.

Blades: H.S.S., Vasco Supreme and carbide. These are interchangeable over a wide range of housing sizes, and Type "A" face milling blades will fit any standard Lovejoy Type "A" cutter of 4½" to 24" dia. All Lovejoy blades are carried in stock, ready for immediate shipment. Special cutters are a Lovejoy specialty.

NEW "JOYDEX"

This performance-proved face mill features indexable blades for low cost-per-edge cutting. Exclusive design improvements include — adjustable anvils • extra deep chip flutes • fast, easy indexing • sweep blades for fine finish • double positive, or combination positive and negative rake angles merely by changing blades • rugged, one-piece body • large locking screws. *Try out a new "Joydex" and prove its superiority! ("Joydex" data sheet is yours for the asking).*

Catalogs — include: "Face Mill Catalog No. 31; Side Mill Catalog No. 32; Type "S" Bulletin; Arbor Catalog No. 33; "Speed and Feed" Calculator. Write today for copies desired.

LOVEJOY TOOL COMPANY, INC.
Springfield, Vermont, U.S.A.

NAMES IN THE NEWS . . .

tion Machinery Division. He was previously sales and service manager at the Deerfield Works. **J T Skinner** has been appointed sales manager, Deerfield Products, Construction Machinery Division.

J H Williams & Co, Buffalo Division of **United-Greenfield Corp,** has promoted **John F Schleifer,** a member of the plant engineering department, to the post of superintendent of finishing. Company makes industrial and automotive wrenches, tools, and drop forgings. Mr Schleifer replaces **Milton P Bradley** who has been transferred to U-G's **Whitman & Barnes Division** in Plymouth, Mich, as factory manager.

Barry Controls Inc, Watertown, Mass, manufacturer of shock, vibration, and noise controls, has promoted **A S Chivers** to the newly created post of manager of the Watertown Division. He was formerly manager of the Western Division at Burbank, Calif, and will be succeeded there by **Russell Lowe** who moves up from the post of chief engineer at the Watertown plant.

Potter & Brumfield, Princeton, Ind, Division of **American Machine & Foundry Co,** has named **C Robert Stone** chief production engineer. He was previously manufacturing staff engineer.

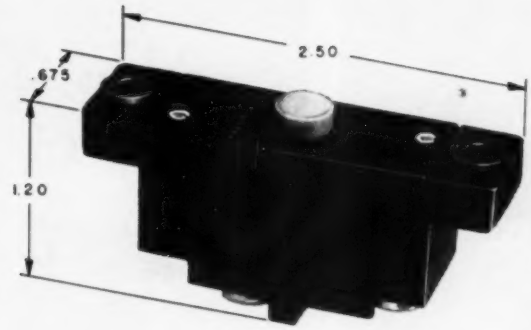
Hycon Mfg Co, Pasadena, Calif, has named **James S Laidlaw** vice president and general manager to succeed **William T Snebold** who has resigned. **Edmund W Baker,** formerly associated with Rheem Mfg Co, succeeds Mr Laidlaw as vice president, engineering.

Dole Valve Co, Morton Grove, Ill, has appointed **Thomas B Chace** to the newly created post of executive vice president. He has been serving as vice president, research and development. **Frank H Byrne** has been promoted from manufacturing manager to vice president, manufacturing.

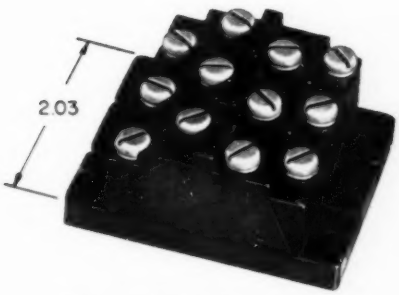
OBITUARY

Frederick W McIntyre Sr, 72, former chairman of the board of the Reed-Prentice Corp, Worcester, Mass, died Oct 8. Mr McIntyre, who retired from the company in 1954, has been a resident of Bal Harbour, Fla, since 1956.

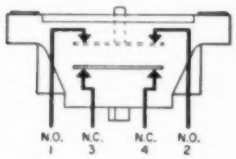
MICRO SWITCH Precision Switches



New "3MN" Series switches for machine tool controls



Bottom view of three switches shows compactness and staggered terminal pattern . . .



Contact arrangement is single-pole two-circuit double-break. Can also be used as a single-pole double-throw switch. Underwriters' Laboratories listed for: 15 amps, 120, 240, 480 or 600 vac; ½ hp, 120 vac; 1 hp, 240 vac; .8 amp, 115 vdc; .4 amp, 230 vdc. Pilot duty rating: 600 vac, max.

For complete information on these "3MN" switches contact your nearest MICRO SWITCH *branch office, or send for Data Sheet 164.*

. . . STACK IN SMALL SPACE

Step design case is only .675 in. wide. Three switches have combined stacking width of just over 2 inches.

. . . INTEGRAL TERMINALS

Terminal arrangement permits gang mounting without insulating barriers. The #8 terminal screws have captive lockwashers.

. . . LONG MECHANICAL LIFE

Median mechanical life is over 10,000,000 operations at full overtravel.

. . . PLENTY OF OVERTRAVEL

Overtravel is .080 in. min.

. . . EASILY MOUNTED

One mounting hole is elongated to eliminate the need for close tolerance in the center-to-center distance between mounting holes on the equipment.

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A division of Honeywell
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MICRO SWITCH Precision Switches

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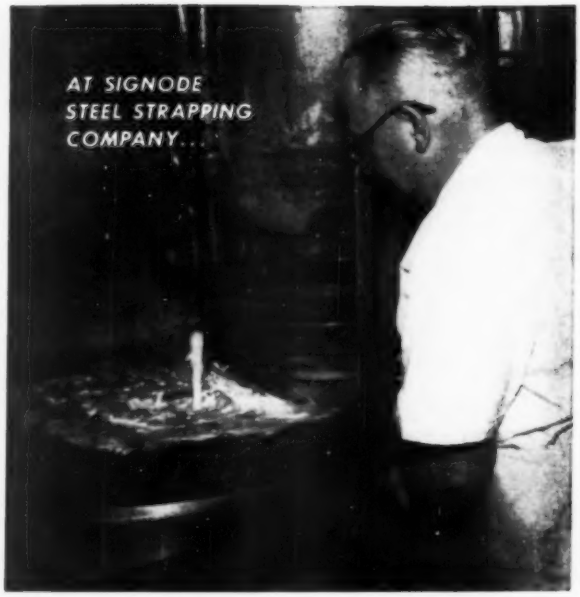

KERNS' SGC-6560 GRINDING COMPOUND aids quality production

Pictured above is one of the Blanchard No. 18 grinders at Signode Steel Strapping Company, Chicago, where Kerns' SGC-6560 grinding compound aids in the precision grinding of feed wheels to a thickness of .243"

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Superior E. P. characteristics
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Superior rust protection
Keeps grinding wheel free
Eliminates odor
Non-irritating to skin
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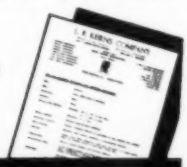
Write for Technical Data Sheet SGC-6560.



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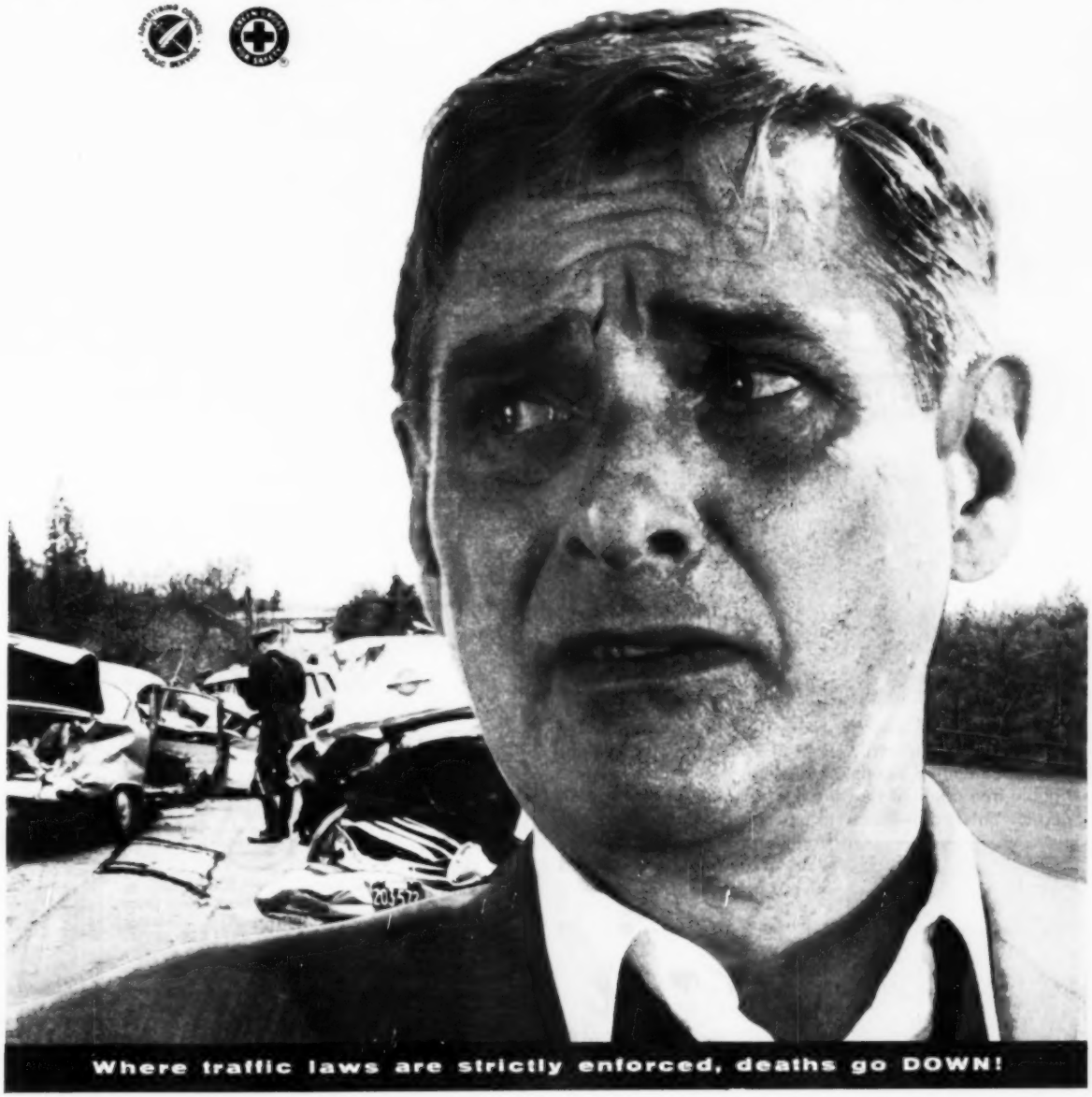

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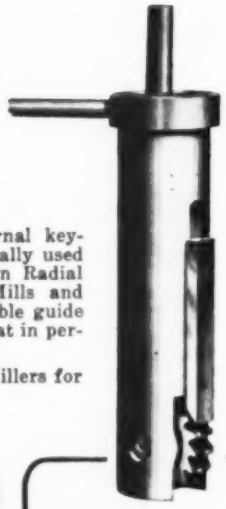
NATIONAL
Keyseating Millers



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BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

485 pages, 480 illus., $8.00

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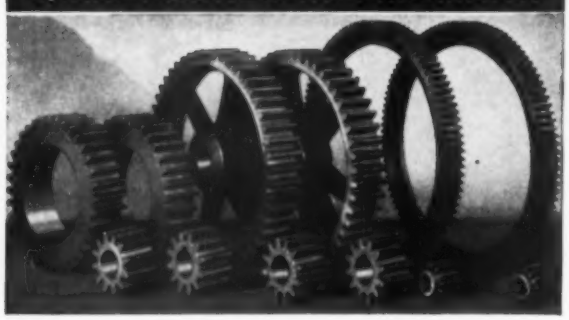

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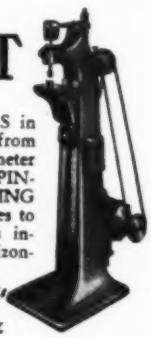

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ANOTHER REPORT FROM THE ALMCO ALBUM OF NEW PRODUCTS

To know what's new in Barrel Finishing

Keep Your Eye on ALMCO!

The right machine, the right method, the right media . . . that's the basis for planning any ALMCO *Supersheen* System. And a continuing program of research, ever seeking even better barrel finishing . . . that's the secret of ALMCO progress in making metal finishing easier, faster and finer . . . and more profitably productive for you. Shown below are typical recent developments that give concrete meaning to the phrase, "*To know what's new in barrel finishing, keep your eye on ALMCO!*"

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For precision finishing of complex high-quality components such as gears, bearing cages, spline shafts, pump rotors, jet blades, etc., on a continuous production line basis. Large parts or clusters of smaller parts are chucked directly to spindles from single operator's work station. Spindles lower parts into high velocity stream of abrasive media contained in tub that rotates at controlled speed. Spindles themselves also rotate while in the abrasive stream, uniformly exposing parts to the abrasive stream. Indexing head slowly carries all spindles in 1 to 9 min. trip around the tub. All surfaces get the same amount of precision finishing.

Models available with automatic or manual indexing, 2 to 16 spindles, tub diameters of 48" to 90", and drives of 5 to 30 hp.

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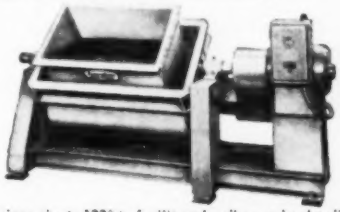

Container pivots 120° to facilitate loading and unloading.

ALMCO *has the right New* BARREL FINISHING EQUIPMENT *for you!*

New ALMCO Roll Barrels

One man operates entire Roll Barrel System. Makes low-cost precision barrel finishing available to any deburring and finishing department! Ideal for finishing large variety of small lots of parts.

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No. 412. A highly concentrated burnishing compound with tallow and oil soap base for use on both ferrous and non-ferrous metals.

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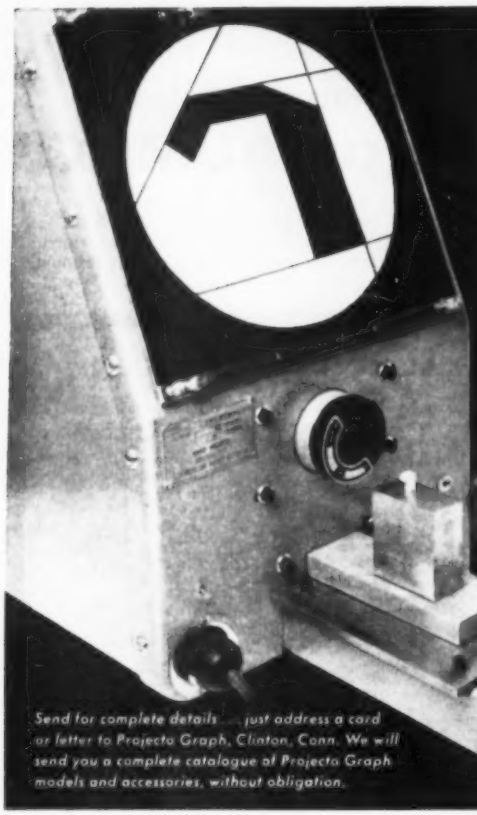

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SEARCHLIGHT SECTION

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Listed below are used, surplus new and rebuilt machine tools or services as advertised in this section.

The numbers after the advertiser's name, indicates the products or services offered by the advertiser.

2. Automatics
3. Balancing Machines
5. Bolt Machines
6. Boring Mills
7. Broaching Machines
9. Centering Machines
10. Chucking Machines
11. Compressors
16. Drilling & Reaming Machines
23. Gear Cutting Machines
24. Grinding Machines
29. Lathes
33. Milling Machines
37. Planers
40. Press Brakes
41. Presses
48. Saws
49. Services
50. Shapers
51. Shears

ADVERTISER	Page No.	KEY TO PRODUCTS OR SERVICES
Cincinnati Machinery Co.	200	6, 10, 24, 29, 33, 37, 50
Eastern Machinery Co.	200	2, 5, 6, 7, 16
Hunter Machine Co., James	199	51
Hyman & Sons, Joseph	200	40, 41, 51
Lucas & Son Inc., J. L.	200	6
Miles Machinery Co.	199	2, 3, 6, 7, 9, 11, 16, 23, 24, 29, 33, 37, 41, 48, 50
National Machinery Exchange	199	40
Noll Equipment Co.	200	29
Republic Machinery Co.	200	6
Uniondale Precision Repair Service Co.	198	49
Wender Presses Inc.	198	41

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11/2/59

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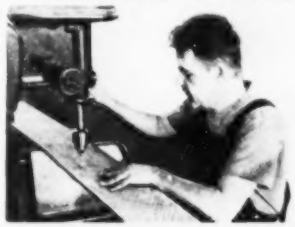

Shown is a Miles mechanic preparing the surface of a new aluminum bronze wearing plate for proper lubrication. This is typical of all Miles re-building . . . rebuilding at its very best.

Auto: 2" RB6 Acme-Gridley, 1944
Auto. Chucker: 8½" No. 665 New Britain, 1948
Balancer: Tinius Olsen prop. shaft, 1948
Borer: DB1212A Ex-Cell-O, 1949
Boring Mill: 4" bar Universal, 60" vert., 1942
Boring Mills: 5" Sellers 60" vert. 1941
Broach: 10 ton 54" American vert. duplex
Centering: 6" x 72" No. 56 Sundstrand
Compressor: 868 CFM Sullivan duplex, 125 HP
Drill, Deep Hole: 420 W. F. & John Barnes, 1942
Drill, Multiple: No. 48L Natco, 36 spdl.
Drill, Upright: 21" Cin. Bick. 1L superservice late
Drill, Radial: 4 11" Carlton, 1941
Drill, Hydr.: No. 25 Ex-Cell-O, late
Gear Hobber: No. 3 Barber Colman, late
Grinder, C'less: No. 12 Landis, 1948
Grinder, C'less: No. 2 Cincinnati, Almatic, 1940
Grinder, C'less: No. 2 Cincinnati, Almatic, 1951
Grinder, Disc: 22" No. 221 Hanchett opposed
Grinder, Int: No. 171 Heald sizematic, 1952
Grinder, Int.: No. 271 Heald plain
Grinder, Int.: No. 74 Heald, 1941
Grinder, T&C: No. 2 Cincinnati, 1944
Grinder, Univ.: 10x24 Landis, late
Lathe, Auto.: 8 x 15" Sundstrand
Lathe, Auto.: No. 8 Gisholt, 1950
Lathes: 13 x 15" LeBlond Regal, 1956
Lathe: 16" x 54" American Pacemaker, 1941
Lathe, Engine: 24" x 120" Monarch Model CM, 1943
Lathe: 25" x 72" Axelson, 1944 also 25" x 18
Lathe: 60" Lodge & Shipley "T" 1954
Lathe, turret: 9½" Hole No. 4L Gisholt
Lathe, turret: No. 4 J & L, presl. 1942
Mills, Boring: 60" Gisholt, vert. OCG
Mill, Boring: 100" Niles vert. PRT
Mills, Prd.: No. 33 Sundstrand Fluid-Servo, 1942
Mills, Prd.: No. 5-48 Cincinnati, late
Mill: No. 5H K&T, plain, vert. hd., 1941
Mill: No. 3KM K&T vert., 1948
Mill: 42" x 42" x 18" ingersoll planer type
Planer: 66" Rockford Hydr. open side, 1941
Press: 125 ton Clearing SS crankless, 1943
Press: 150 ton Lake Erie hydr. 1951

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42" Bullard Spiral Drive, vee belt m.d., 1944
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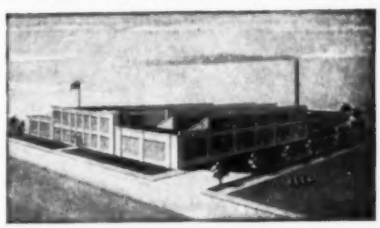

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American Machinist

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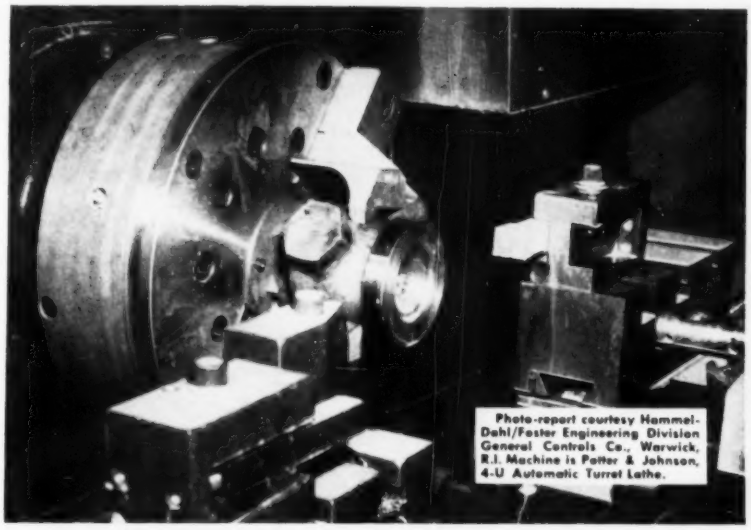

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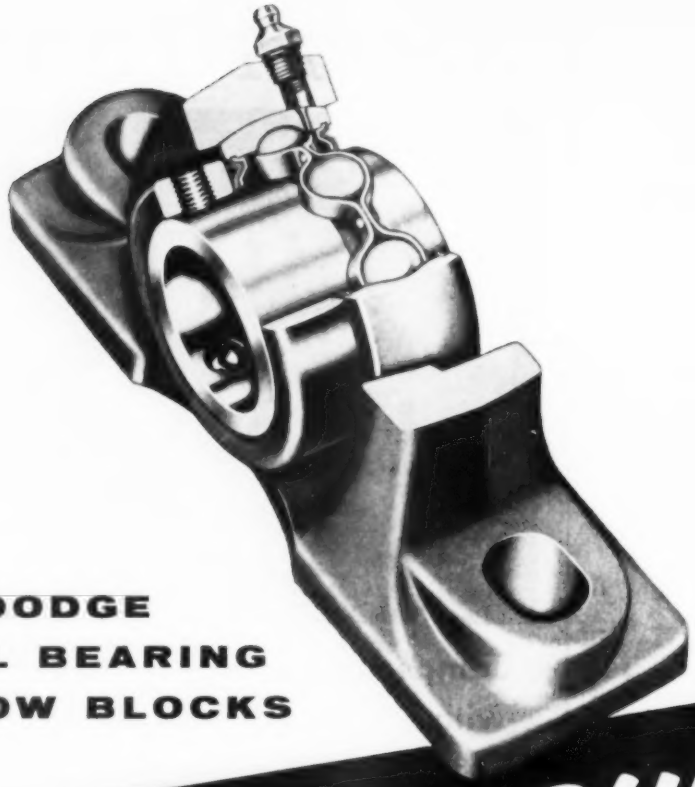

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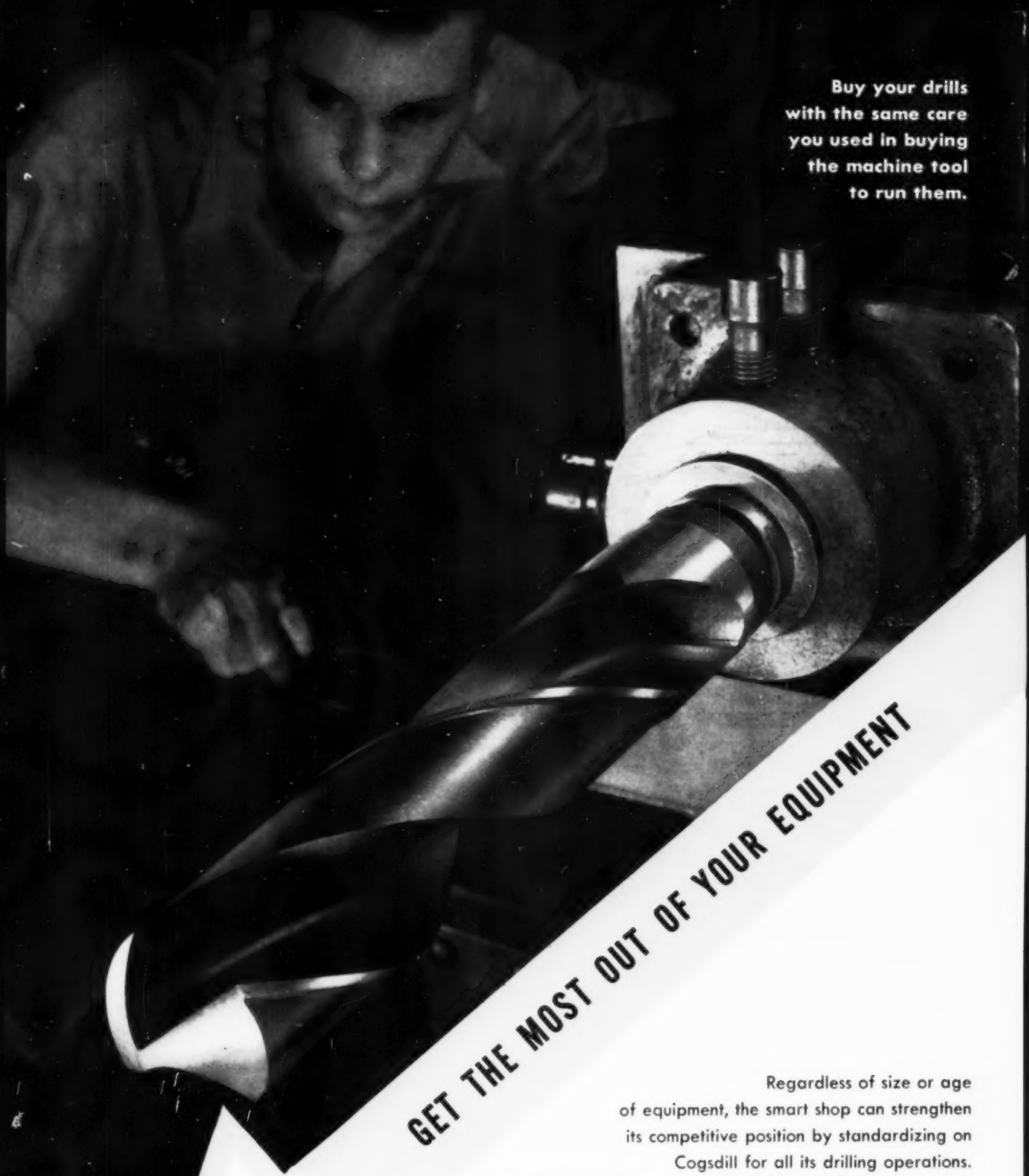

Buy your drills
with the same care
you used in buying
the machine tool
to run them.

GET THE MOST OUT OF YOUR EQUIPMENT

Regardless of size or age
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its competitive position by standardizing on
Cogsdill for all its drilling operations.
Cogsdill twist drills are unsurpassed for uniform life and
performance, with longer runs between tool changeover.

Cogsdill . . . the name to remember for quality
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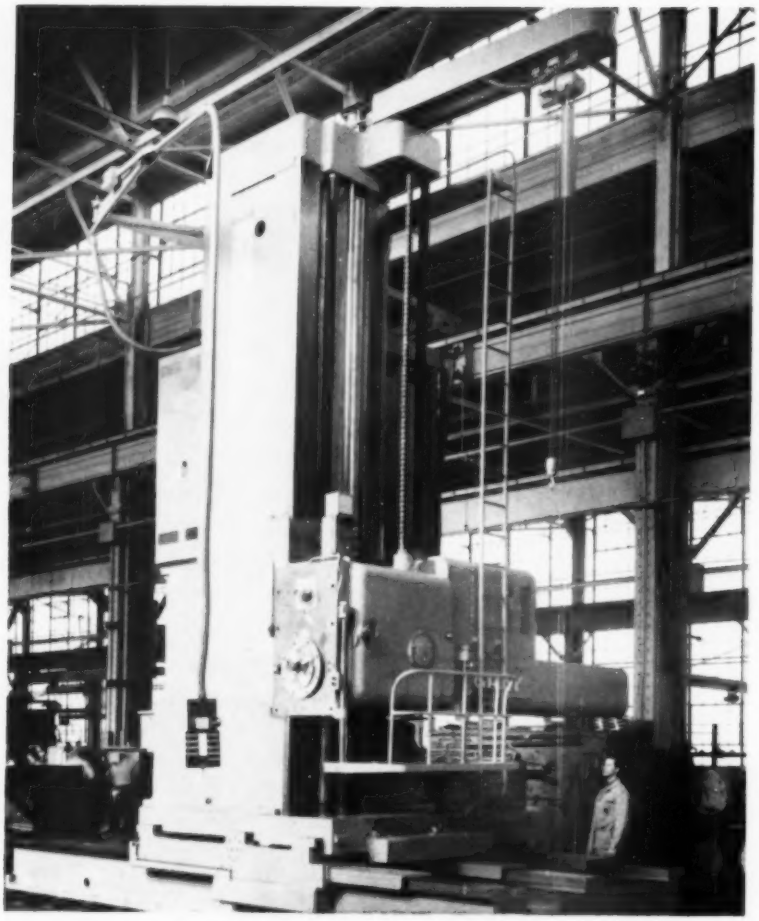
COGSDILL TWIST DRILL CO., INC., Greenfield, Mass.

Stocking Warehouses: Detroit, Los Angeles, Greenfield

CIRCLE 152 READER SERVICE CARD

"We switched to TIMKEN® bearings to get greater accuracy and capacity," reports The G. A. Gray Company

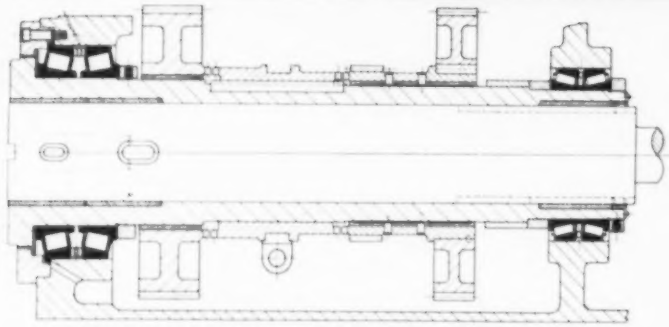


HERE'S a precision giant! It's The G. A. Gray Company's new 212½-ton Model 880-FC horizontal boring, drilling and milling machine. Weighing 425,000 lbs., it stands 27 ft. high, spans 76½ ft. in length. It can machine a block of metal 65 ft. long and 15½ ft. high—works with a precision of .00025". Yet one man operates the huge tool. To keep the spindle running accurately, Gray engineers switched to Timken® tapered roller bearings.

Spindle held rigid. Timken bearings hold the spindle in positive alignment. Their tapered design lets them take both radial and thrust loads in all combinations. And full-line contact between rollers and races gives Timken bearings extra load-carrying capacity.

Heavy shocks no problem. Rollers and races of Timken bearings are case-carburized to have hard, wear-resistant surfaces and tough, shock-resistant cores.

Friction virtually eliminated. Timken bearings are geometrically designed and precision-made to roll true. They roll the load. They practically eliminate friction, run smoother, longer with minimum maintenance. And you can get Timken tapered roller bearings with maximum runout of 75 millionths of an inch. For all these advantages, specify bearings trademarked "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.



How **THE G. A. GRAY COMPANY** mounts the spindle of its new Model 880-FC boring machine on Timken tapered roller bearings to get spindle accuracy, assure precision performance.

This symbol on a product means its bearings are the best.

BETTER-ness rolls on TIMKEN® tapered roller bearings

CIRCLE 153 READER SERVICE CARD